Utah State Implementation Plan

SECTION IX
CONTROL MEASURES
FOR AREA and POINT SOURCES

Part C
CARBON MONOXIDE

SALT LAKE CITY
OGDEN
UTAH COUNTY

Adopted by the Air Quality Board
January 7, 1998

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UTAH STATE IMPLEMENTATION PLAN

CONTROL MEASURES FOR AREA AND POINT SOURCES

CARBON MONOXIDE

SECTION IX PART C

IX.C.l Non-Attainment Areas

National Ambient Air Quality Standards (NAAQS) have been established to protect public health and welfare. The health-related standards for carbon monoxide (CO) are nine parts per million over an eight-hour averaging period and 35 parts per million over a one-hour averaging period (not to be exceeded more than once per year). The one-hour standard has not been exceeded anywhere in the state. Measured exceedances of the eight-hour standard have been observed in the cities of Salt Lake, Ogden, Provo, and Bountiful. On March 3, 1978 the EPA designated these cities as non-attainment areas in accordance with the provisions of Section 107 of the Clean Air Act. On December 2, 1983, the EPA redesignated Bountiful as an attainment area for CO based on eight quarters of ambient air data collected by the state which demonstrated attainment.

In response to new siting guidelines published by the EPA, CO monitoring sites were established in Salt Lake City on State Street between 200 and 300 South, on University Avenue in Provo between Center Street and 100 North, and in Ogden, on Washington Blvd. between 2900 and 3000 Street. The data collected at the new sites showed concentrations higher than at the original sites, and were used in determining the design values for Salt Lake and Provo.

On December 19, 1984, the state was officially notified that EPA found substantial inadequacies in this SIP for Provo. Section IX.C.6 was added to this SIP in response to EPA's requirements. It detailed those strategies which were followed to attempt to provide for attainment of the CO standard in Utah County by the mandatory 1987 deadline specified in the Clean Air Act of 1977.

On November 15, 1990, Congress amended the Clean Air Act which resulted in new requirements for this SIP, as well as designation of each of the three counties to various levels based on monitoring data from 1988-1989. Specifically, Ogden and Provo were designated as "moderate" non-attainment areas, and, because Salt Lake did not have any violations of the CO standard during 1988-1989, it was designated as a "not classified" non-attainment area.

As specified in the Clean Air Act, this SIP was modified to include specific requirements for each area. For Salt Lake, all that was required in Section 187 was the submittal of the 1990 base-year emissions inventory and implementation of a basic vehicle inspection and maintenance (I/M) program. For Ogden, the state was required to submit a 1990 base-year emissions inventory, implement a basic I/M program, and implement an oxygenated fuels program. For Ogden, Section 172 requires the submittal of a contingency plan. For Provo, the requirements include the expansion of the nonattainment area boundaries, updating of the emissions inventory to include the 1990 base-year, the development of an oxygenated fuels program, inclusion of vehicle miles travelled (VMT) tracking milestones, the development of an attainment demonstration, and the development of contingency measures which could be implemented if attainment of the standard was not realized or if the VMT tracking milestones were exceeded.

The sections of this SIP dealing with each of these areas was modified to include these new requirements.

IX.C.2 Carbon Monoxide Concentrations and Data Analysis (Salt Lake City and Ogden)

This section was adopted prior to the promulgation of the Clean Air Act Amendments of 1990. Therefore, all references in this section to this SIP, control requirements, and inventories refer to those which were in effect prior to 1990.

A summary of the measured exceedances of the eight-hour standard in Ogden for the years 1980 and 1981 and in Salt Lake for 1982 is shown in Table IX.C.1. High values such as these occur under adverse meteorological conditions (temperature inversions) which exist primarily from November through March.

Table IX.C.1
8-HOUR CO VALUES EXCEEDING THE NAAQS
OGDEN AND SALT LAKE CITY

OGDEN		SALT LAKE CITY
1980	**1981**	**1982**
12	10	12
11		10
10		13
13		10
11		10
		11
		10
		11

(parts per million)

Because atypical meteorological conditions were observed in 1980 and 1981, the state determined that neither year could be considered representative for purposes of SIP planning. It was determined that an average of the second high concentration observed in these two years was appropriate for use as a design value for Ogden in this SIP (see the technical support document). For Salt Lake City, the design value used in this SIP was the second high State Street 8-hour value observed in 1982. The calculated design values for the areas of concern are as follows:

Salt Lake City	12.1 ppm
Ogden	10.5 ppm

The following necessary reductions in carbon monoxide were calculated for each area:

Salt Lake City	26%
Ogden	11%

IX.C.3 Carbon Monoxide Emissions (Salt Lake City and Ogden)

a. Prior to 1990

The most significant source of carbon monoxide emissions in the Wasatch Front is highway motor vehicles. However, annual emissions inventories reveal that space heating and industrial sources contribute measurable amounts to the total inventory.

Table IX.C.2 shows the 1980 annual carbon monoxide emissions inventory for Salt Lake and Weber Counties.

Table IX.C.2
ANNUAL CO EMISSIONS INVENTORY SUMMARY: 1980
SALT LAKE AND WEBER COUNTIES

SOURCE CATEGORY	SALT LAKE COUNTY (t/y)	WEBER COUNTY (t/y)
Highway Vehicles	309500	66900
Off-Highway Vehicles	8532	2172
Other Transportation	5346	1955
Process Industries	304	1005
Space Heating	15659	3654
Electric Power Generation	471	47
Forest Fires	1908	1259
TOTAL	341720	76992

Emissions of carbon monoxide and associated peak measured ambient levels tend to be concentrated in the urban cores of Salt Lake City and Ogden. Table IX.C.3 shows typical winter daily inventories for these cities.

Table IX.C.3
DAILY CO EMISSIONS INVENTORY SUMMARY: PRE-1990
SALT LAKE CITY AND OGDEN

	SALT LAKE CITY (1982) (t/d)	OGDEN (1980) (t/d)
Highway Vehicles	316.88	107.2
Space Heating	27.5	11.0
Other Sources	10.6	6.4
TOTAL	354.98	124.6

b. Required by 1990 Clean Air Act Amendments

Table IX.C.4 is a summary of the 1990 base-year annual inventory for Salt Lake City; Table IX.C.5 shows comparable data for Ogden. **Figure IX.C.1** and **Figure IX.C.2** summarize the daily and annual emissions inventory for Salt Lake City, respectively. **Figure IX.C.3** and **Figure IX.C.4** summarize the daily and annual emissions inventory for Ogden, respectively. No major point sources of 100 tons/year of CO were identified in Salt Lake City or Ogden. The complete inventory and the required documentation is contained in the Technical Support Document.

Table IX.C.4
BASE-YEAR (1990) CO EMISSIONS INVENTORY
SALT LAKE CITY

AREA SOURCES		**Tons/Year**	**Tons/Day**
Stationary External Combustion	Orchard Heaters	N/D	N/D
	Woodburning/Fireplaces	2334.48	13.56
	Coal - Residential	13.61	Neg
	Coal - Commercial	1.51	.01
	Coal - Industrial	.07	Neg
	Gas - Residential	28.21	Neg
	Gas - Commercial	Neg	Neg
	Gas - Industrial	21.83	.02
	Oil - Residential	.62	Neg
	Oil - Commercial	.72	Neg
	Oil - Industrial	35.74	.13
Waste Disposal, Treatment, and Recovery	Incineration - Com	48.2	.13
	Incineration - Ind	26.16	.07
Miscellaneous Sources	Forest Fires	N/D	N/D
	Fire-fighting Training	Neg	Neg
	Structural Fires	.2	Neg
	Prescribed Burning/ Slash Burning/ Agricultural Burning	N/D	N/D
	Open Burning/Detonation	N/D	N/D
	Aircraft/Rocket Engine Firing/Testing	19.6	.06
	Charcoal Grilling	N/I	N/I
MOBILE SOURCES			
On-Road	On-Road	63249.42	228.78
Non-Road	Aircraft	1959.58	5.75
	Railroads	68.22	.19
	Misc Non-road Equipment	2285.06	1.92
POINT SOURCES		N/D	N/D
TOTAL CO EMISSIONS - SALT LAKE CITY, UTAH		70093.23	250.62

PT/S =Reported as a point source. N/A =Not applicable.
N/I= No info available N/D =Negative declaration. Neg =Negligible amount.
Number may vary slightly from report due to rounding. Numbers may not add due to rounding.

Figure IX.C.1

BASE-YEAR (1990) CO EMISSIONS INVENTORY
SALT LAKE CITY
DAILY EMISSIONS SUMMARY

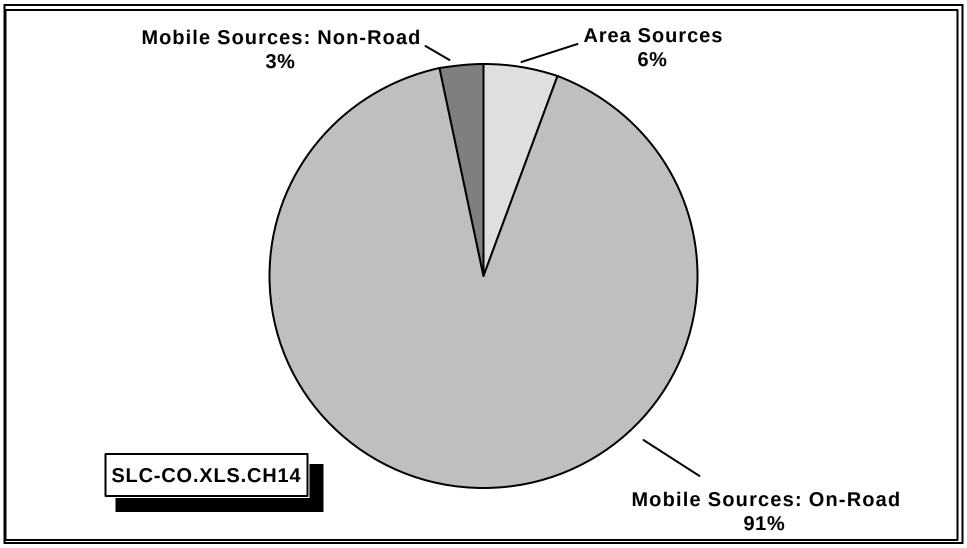


Figure IX.C.2

BASE-YEAR (1990) EMISSIONS INVENTORY
SALT LAKE CITY
ANNUAL EMISSIONS SUMMARY

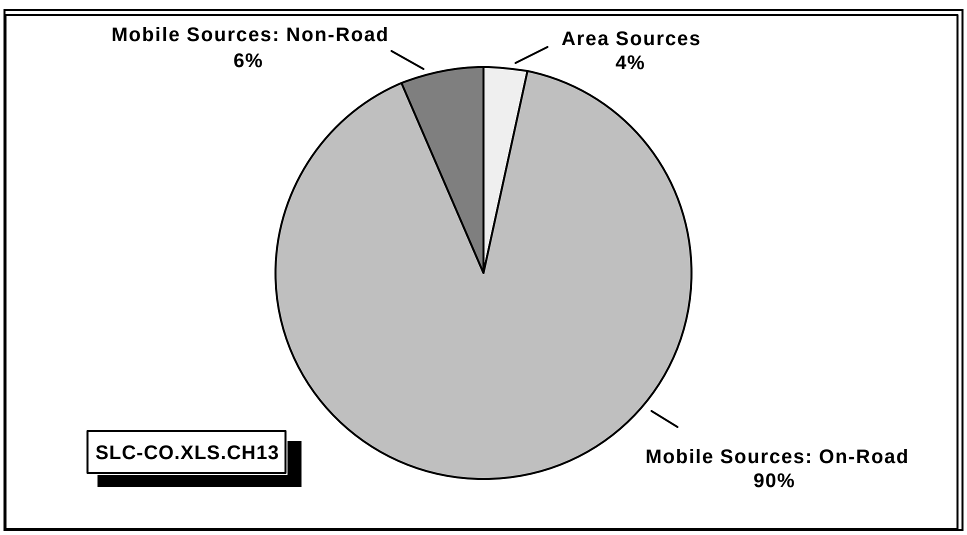


Table IX.C.5

BASE-YEAR (1990) CO EMISSIONS INVENTORY

OGDEN

AREA SOURCES		Tons/Year	Tons/Day
Stationary External Combustion	Orchard Heaters	N/D	N/D
	Woodburning/Fireplaces	932.84	5.42
	Coal - Residential	5.44	Neg
	Coal - Commercial	.60	Neg
	Coal - Industrial	28.85	Neg
	Gas - Residential	.26	Neg
	Gas - Commercial	Neg	Neg
	Gas - Industrial	19.98	.04
	Oil - Residential	.25	Neg
	Oil - Commercial	.29	Neg
	Oil - Industrial	14.28	.05
Waste Disposal, Treatment, and Recovery	Incineration - Com	19.26	.05
	Incineration - Ind	14.05	.04
Miscellaneous Sources	Forest Fires	N/D	N/D
	Fire-fighting Training	Neg	Neg
	Structural Fires	.08	Neg
	Prescribed Burning/ Slash Burning/ Agricultural Burning	N/D	N/D
	Open Burning/Detonation	1.69	N/D
	Aircraft/Rocket Engine Firing/Testing	3.21	Neg
	Charcoal Grilling	N/I	N/I
MOBILE			
On-Road	On-Road	22356.48	67.80
Non-Road	Aircraft	321.10	.52
	Railroads	26.46	.07
	Misc Non-road Equipment	361.10	.30
POINT SOURCES		N/D	N/D
TOTAL CO EMISSION OGDEN, UTAH		24106.22	74.29

PT/S =Reported as a point source. N/A = Not applicable.
N/I= No info available N/D =Negative declaration Neg =Negligible amount.
Number may vary slightly from report due to rounding. Numbers may not add due to rounding.

Figure IX.C.3

BASE-YEAR (1990) CO EMISSIONS INVENTORY

OGDEN

DAILY EMISSIONS SUMMARY

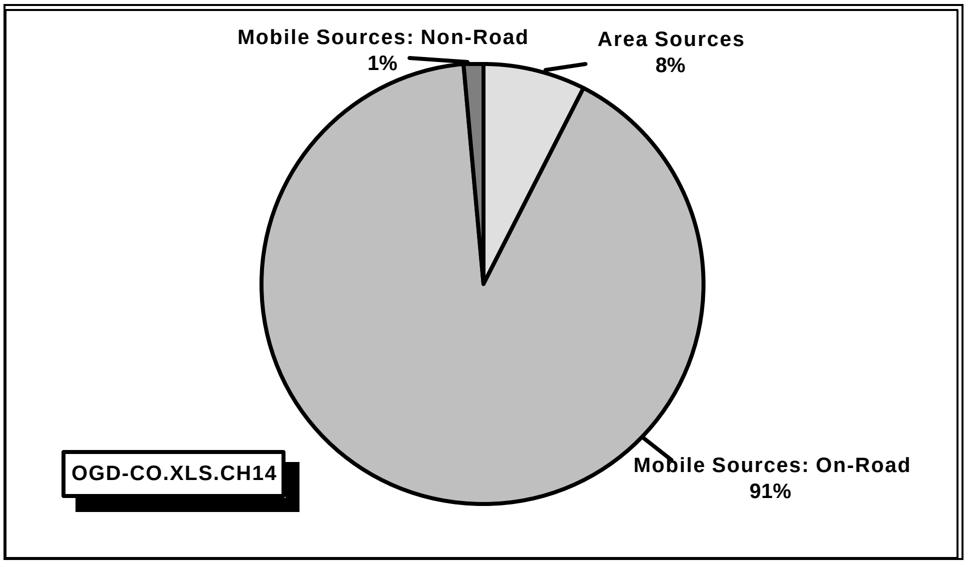
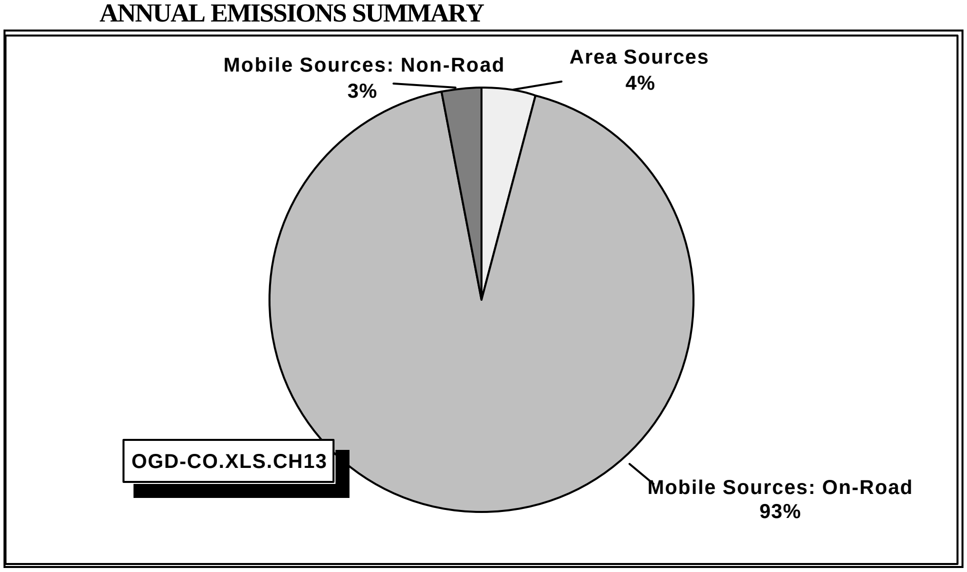


Figure IX.C.4

BASE-YEAR (1990) CO EMISSIONS INVENTORY

OGDEN

ANNUAL EMISSIONS SUMMARY



IX.C.4 Control Strategy (Salt Lake City and Ogden)

The following control strategies were predicted to reduce emissions to the extent necessary to attain the National Ambient Air Quality Standards (NAAQS) for carbon monoxide:

- Federal Motor Vehicle Control Program (FMVCP)
- Automobile Inspection/Maintenance (I/M)
- Transportation Control Measures (TCM)

a. Federal Motor Vehicle Control Program

The FMVCP requires vehicle manufacturers to certify that new vehicles meet federal vehicle emission standards. As the older vehicles are replaced by newer vehicles with better controls, a dramatic reduction in vehicle emissions is being observed. In 1983 the "all modes" emission factor for 20 miles/hour was 111.16 grams per vehicle mile; in 1987 it is predicted to be reduced to 86.43 grams per vehicle mile. This represents a 22% reduction in CO emissions per vehicle mile.

b. Automobile Inspection/Maintenance

The EPA determined that under the provisions of Section 172 of the Clean Air Act, an automobile inspection and maintenance program (I/M) was required as Reasonably Available Control Technology (RACT) for CO reduction in Salt Lake County and for ozone reduction in Salt Lake and Davis Counties to demonstrate attainment of the NAAQS. The I/M programs developed by both counties were designed to result in a 25% reduction of CO and a 25% reduction in HC as determined using Mobile2.

On July 21, 1983, the Utah State Legislature amended the State Motor Vehicle Code to include Sections 41-6-163.(5) and (6), Utah Code Annotated 1953, which gave county governments authority to implement I/M programs in counties affected by Section 172 of the Clean Air Act. The Statute requires that this program be in place until the NAAQS are attained in the affected county. This Statute is contained in Section X, Appendix 1.

The Salt Lake County Board of Health adopted an implementation schedule and regulations establishing an I/M program. The program was fully implemented by April 1, 1984, according to the schedule submitted to the EPA in 1983. The current regulations are contained in Section X, Appendix 7.

The Davis County Commission adopted an implementation schedule and a county ordinance establishing an I/M program. The program was fully implemented by April 1, 1984, according to the schedule submitted to the EPA in 1983. The current county ordinance is contained in Section X, Appendix 6.

c. Transportation Control Measures

The application of TCMs in the Salt Lake City and Ogden areas was developed by the Wasatch Front Regional Council (WFRC) in their document "Traffic Control Measures for the Wasatch Front Region" January 1982. The document is incorporated by reference into this State Implementation Plan and a brief summary is provided in Section XI, Appendix 2.

It was determined that the following control strategies were appropriate for Salt Lake and Ogden:

Salt Lake - Transit Improvements, Ridesharing, and Traffic Flow Improvements; and
Ogden - Transit Improvements and Ridesharing.

(1) Salt Lake City

(a) Transit Improvements

The Utah Transit Authority proposes to increase the number of service miles in the Wasatch Front service area from 10.5 million in 1980 to 16 million by 1996. This is contingent upon their obtaining additional funding. This increase in service miles was predicted to result in a 2.1% reduction in region-wide carbon monoxide emissions.

(b) Ridesharing Program

A transportation brokerage was planned and implemented by the Wasatch Front Regional Council, Utah Transit Authority, and the Utah Energy Office which coordinates individual transportation needs. The brokerage concentrates its efforts on commuters. In addition, the program to build park and ride lots will be continued.

Major activities include:

l) Carpool and vanpool promotion and matching services for large firms, including interest-free loans for van purchases.
2) Region-wide carpool promotion and matching.
3) Dissemination of transit schedules.
4) Examination of commuter market needs.

This program was predicted to reduce emissions in Salt Lake City by 0.4%.

(c) Traffic Flow Improvements

The principal traffic flow improvement project was the computerization of traffic signals in Salt Lake City. This involved approximately 168 signals in an eight square mile area. It was estimated that carbon monoxide emissions in Salt Lake City would be reduced by 0.5%, (from 260 to 259 T/D) as a result of this strategy.

(2) Ogden

(a) Transit Improvements

As discussed under Salt Lake City Transit Improvements, region-wide carbon monoxide emissions were expected to be reduced 2.l% as a result of improved transit.

(b) Ridesharing Program

Ogden participates in the transportation brokerage discussed in connection with the Salt Lake City Ridesharing Program. It is estimated that carbon monoxide emissions within Ogden City were reduced by 0.3% as a result of this program.

d. Other Strategies

Other strategies which have not been studied by either Mountainlands Association of Governments (MAG) or WFRC include: (1) control of fleet operations; (2) retrofit programs; (3) extreme cold starts. Comments on these additional strategies are:

(1) Control of Fleet Operations

For several years, Mountain Fuel Supply has conducted studies on the feasibility of converting motor vehicles to compressed natural gas. The Department of Health participated in these studies and has encouraged fleet owners to convert to compressed natural gas. The use of compressed natural gas results in a reduction of automobile emissions if the system is properly tuned and maintained, and these conversions will continue to be encouraged.

(2) Retrofit Programs

As of this time, EPA has not certified any retrofit devices which reduce emissions in a feasible manner. The Air Quality Board will continue to monitor the EPA efforts in this area.

(3) Extreme Cold Starts

The winters in Utah are comparatively mild; therefore, strategies to control emissions from extreme cold starts are inappropriate for this area.

IX.C.5 Demonstration of Attainment and Reasonable Further Progress (Salt Lake City and Ogden)

a. Salt Lake City

From Section IX.C.3, the Salt Lake City 1982 typical winter weekday inventory of CO was 354.98 tons/day. From Section IX.C.2, the necessary reduction to attain the 9 ppm level was 26%. Therefore the attainment inventory was:

$$354.98 \text{ tons/day } (1 - 0.26) = 262.69 \text{ tons/day}$$

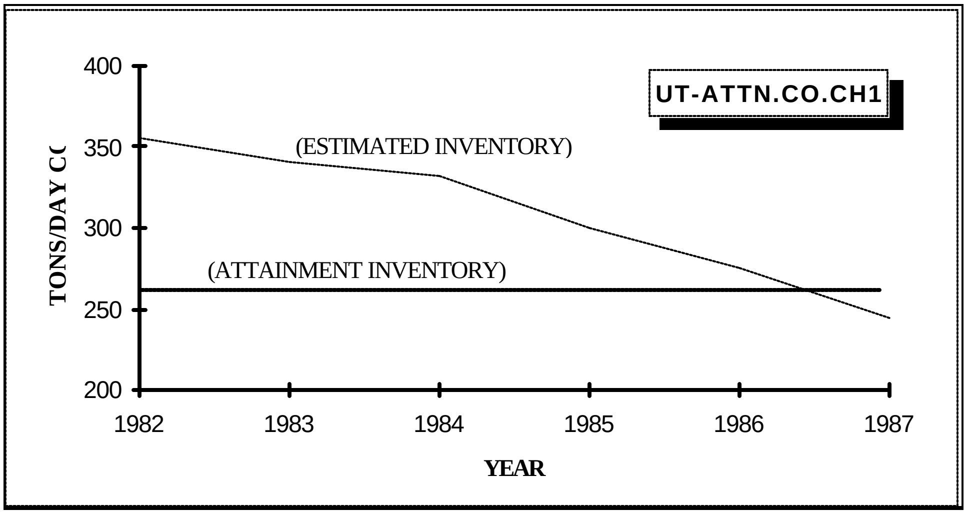
Table IX.C.6 shows the effective winter weekday emission inventory for downtown Salt Lake City on the date when it was predicted to reach this level. The values are in tons of carbon monoxide per day.

Table IX.C.6
WINTER WEEKDAY CO EMISSION INVENTORY
SALT LAKE CITY

	1982 (t/d)	**Nov 15, 1986 (t/d)**
Highway Vehicles	316.88	247.7
Space Heating	27.5	27.5
Other Sources	10.6	10.6
Total	354.98	285.8

Figure IX.C.5 illustrates reasonable further progress. Table IX.C.4 on page 4, shows that the 1990 daily inventory is 250.62 tons/day, well below the necessary attainment inventory.

Figure IX.C.5
DEMONSTRATION OF REASONABLE FURTHER PROGRESS
SALT LAKE CITY



b. Ogden

From Section IX.C.3 the 1980 Ogden City typical winter weekday inventory was 124.6 tons/day. From Section IX.C.2 the necessary reduction to attain the 9 ppm level was 11%. Therefore the attainment inventory was:

124.6 tons/day (1 - 0.11) = 110.9 tons/day.

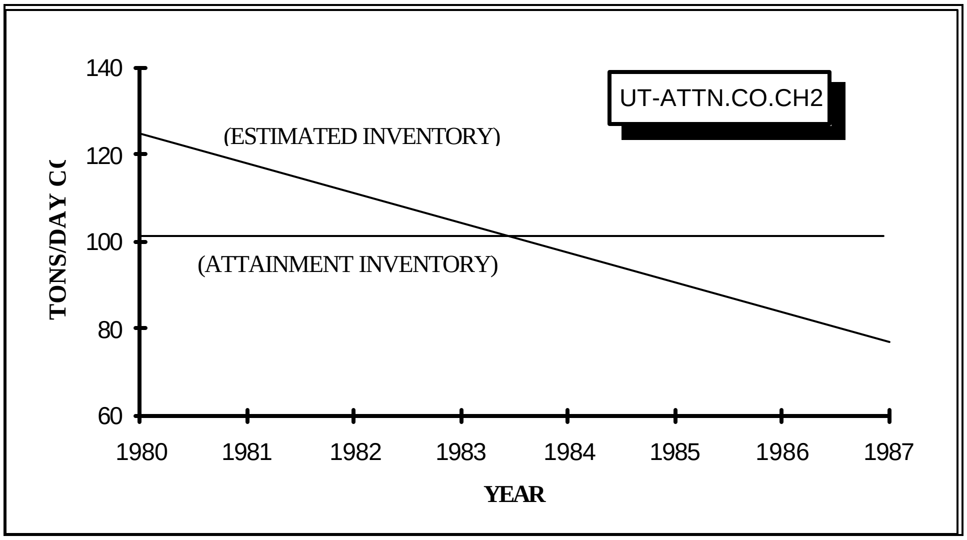
Table IX.C.7 shows the dates on which the effective winter weekday emission inventory for downtown Ogden was predicted to reach this level. The values are in tons per day of carbon monoxide:

Table IX.C.7
WINTER WEEKDAY CO EMISSION INVENTORY
OGDEN

	1980 (t/d)	**July 1, 1982 (t/d)**
Highway Vehicles	107.2	93.5
Space Heating	11.0	11.0
Other Sources	6.4	6.4
Total	124.6	110.9

Figure IX.C.6 illustrates reasonable further progress. Table IX.C.5 on page 6, shows that the 1990 daily inventory is 74.29 tons/day, well below the necessary attainment inventory. As required by the Clean Air Act, revised emissions inventories will be submitted at least every three years, beginning in 1995.

Figure IX.C.6
DEMONSTRATION OF REASONABLE FURTHER PROGRESS
OGDEN



IX.C.6 Provo

a. Effects of the Clean Air Act Amendments of 1990

As a result of the passage of the Clean Air Act Amendments of 1990 (CAAA), Congress required EPA to determine the precise area to be designated as non-attainment. It was EPA's policy that the non-attainment area would include the entire metropolitan statistical area (MSA) which experienced the monitored violations of the NAAQS. For the Provo area, the MSA includes all of Utah County. Because Utah County includes many rural areas which are highly unlikely to impact the attainment status of the Provo area, it was the position of both state and local government officials that the non-attainment area should be considerably smaller than all of Utah County.

On March 15, 1991, as required by the Act, Governor Bangerter submitted notification to EPA that Provo City was a non-attainment area for CO, as it was prior to adoption of the Clean Air Act Amendments of 1990. In subsequent letters sent to EPA in May and June, the state committed to several tasks to verify that the actual area of non-attainment would be identified during the SIP development process. Those commitments included the following items:

(1) the development of a comprehensive base-year (1990) emissions inventory for all of Utah County, which would also include Provo City, the entire urbanized area, as well as VMT tracking numbers for the entire Federal Aid Urban (FAU) area;
(2) a commitment that all CO emissions from all major VMT inducing sources would be mitigated, and that VMT from projects under development would be included in VMT data used to demonstrate attainment of the NAAQS;
(3) an oxy-fuel program would be implemented in Utah County, and the I/M program strengthened as necessary to meet the NAAQS;
(4) the state would collect the data necessary to use the Urban Airshed Model (UAM) and use UAM to examine the urbanized CO problem, perform appropriate industrial source complex modeling for the major point sources, do hot-spot intersectional analysis as appropriate, and negotiate a modeling protocol with EPA prior to performing any of the modeling; and
(5) the state would work with EPA to develop a monitoring protocol for CO and meteorological data collection, and operate the monitoring network in accordance with 40 CFR Parts 51 and 58. (See the March 19, 1992, governor's letter to EPA contained in the Technical Support Document).

Several scoping meetings were held to solicit public input on the question of whether the non-attainment area should include the entire county, the Provo Urbanized Area, or just the City of Provo. During the comment period, several different points of view were expressed, and the various parties could not reach a consensus. EPA agreed to identify Provo as the non-attainment area, and acknowledged that the actual area of non-attainment would be determined during the SIP development process.

Upon the conclusion of the SIP development process, it was determined through modeling that the only areas in the county where violations of the standard occur are in Provo and Orem. Had the state chosen an area smaller than the city boundaries for both cities, the state would have had to demonstrate that the standard was not being exceeded at each intersection in the area excluded from the non-attainment area. For this reason, as well as the fact that one of the control strategies involves a periodic mandatory ban on the use of wood and coal burning stoves in the actual area of non-attainment, it was decided that the non-attainment area would be restricted to the Provo/Orem City limits. As those boundaries change, it is the intent of this plan that any new areas which are incorporated into either city boundary will be included in the non-attainment area. The modeling analysis used to make this determination is discussed further in Section IX.C.6.k of this SIP. The control strategies are discussed in greater detail in Section IX.C.6.j.

As discussed in detail in Section IX.C.6.b, this area is classified as a moderate non-attainment area for carbon monoxide. This SIP is required to demonstrate that the non-attainment area will attain the NAAQS for CO by December 31, 1995 (See 186(a)(1), Act). Because the design value is above 12.7, this SIP is required by the Act to contain the following items and will follow the same outline:

a base-year emissions inventory (187(a)(1));
a forecast of Vehicle Miles Travelled (VMT) through the attainment year (187(a)(2));
a set of contingency measures to be implemented if the VMT forecasts are exceeded or attainment is not realized (187(a)(3));
implementation of a basic I/M program (187(a)(4));
a commitment to submit emissions inventories every 3 years (187(a)(5));
implementation of Enhanced I/M for areas meeting specific requirements (187(a)(6)); and
an attainment demonstration with necessary control strategies (187(a)(7)).

In addition, Section 211(m) of the Act requires the implementation of an oxygenated fuel program, and Section 173 requires a revision, if necessary, of the New Source Review (NSR) rules to meet EPA specifications. The discussion of the implementation of the oxygenated fuels program is contained in Section j, Control Strategies. The required NSR revisions were addressed in previous revisions of this SIP. Section 110(a)(2) of the Act, in conjunction with Sections 114 and 504, requires the state to revise this plan to meet new enhanced monitoring requirements. When the state receives a SIP call from EPA to implement the required changes, the state will revise this plan and submit it to EPA by the later of either the issuance of the final federal enhanced monitoring rule or the final approval of the state's operating permit program.

The attainment demonstration required in Section 187(a)(7) of the Act contains the base-year modeling using the base-year emissions inventory, a projected emissions inventory with no additional controls applied and the modeling for that scenario, a discussion of the control strategies which will be applied, and the resulting projection-year emissions inventory and modeling analysis. It is that projection-year modeling analysis with applied control strategies which serves as the attainment demonstration. The state is also including a "Projected County-Wide Emissions Inventory", which is included immediately following the base-year emissions inventory in Section IX.C.6.d.

b. Ambient Air Monitoring, Design Value Determination, Classification, and Non-Attainment Area Boundary,

In 1964 the state began to monitor carbon monoxide (CO) in Utah County. Monitoring for CO was first performed on the roof of the Utah County Courthouse at 90 South 100 East. Monitoring for CO continued at this location until January 1983.

On August 7, 1977, the Clean Air Act was amended, and Section 319 required EPA to establish monitoring criteria to be followed uniformly across the nation. On May 10, 1979 EPA promulgated those monitoring criteria and established 40 CFR Part 58, "Ambient Air Quality Surveillance."

The state reviewed the EPA requirements and determined the existing CO monitoring sites in Utah County did not meet the requirements. The site on the roof of the County Courthouse was over 15 meters high and did not meet the requirements of either a micro-scale or neighborhood scale setting. It was obvious that new monitoring sites had to be established in order to meet the EPA requirement.

In September, 1981, a CO monitor was installed at 19 North University Avenue. Although the site was more than 10 meters from the intersection, there was concern that it was too close to the intersection. That concern became academic when the lease for the space was lost due to a remodeling program. In July 1984 the CO monitor was installed at its present location at 240 North University Avenue. This site is more representative of a mid-block location recommended by EPA.

Data from the site show the National Ambient Air Quality Standard for CO is being violated several days per year. The data also show the CO situation to be improving. The number of times the NAAQS is exceeded is decreasing and the magnitude of the eight-hour concentration has also been decreasing. The improvement is attributed to a combination of newer, cleaner operating cars and the vehicle inspection and maintenance program. The data collected at the University Avenue station are collected in accordance with the Monitoring Network Review, Quality Assurance Manual and 40 CFR Part 58. Table IX.C.8 below shows the data collected since 1985 at the University Avenue Station in Provo. **Figure IX.C.7** and **Figure IX.C.8** show the trends for that data. The data is used for the University Avenue Station since it is the station reporting the highest monitored concentrations of CO in Utah County. Table IX.C.9 and **Figure IX.C.9** show the locations of the monitoring sites in Utah County.

Table IX.C.8
CO MONITORING DATA SUMMARY
PROVO
UNIVERSITY AVENUE

Year	Highest 8-Hour (ppm)	Date	2nd Highest 8-Hour (ppm)	Date	Yearly # of Exceedances
1985	14.3	1/8	11.3	1/4	13
1986	14.9	1/15	14.4	12/3	24
1987	14.0	11/21	13.3	10/28	20
1988	11.3	12/14	11.0	1/29	5
1989	16.0	12/5	15.8	11/21	12
1990	19.9	1/10	16.2	1/11	11
1991	13.7	12/18	11.6	12/16	6
1992	11.0	1/25	10.0	11/15	3
1993	10.1	11/29	9.6	12/15	2

Figure IX.C.7

MONITORED CO CONCENTRATIONS: 1985 - 1993

UTAH COUNTY

UNIVERSITY AVENUE #2 SITE

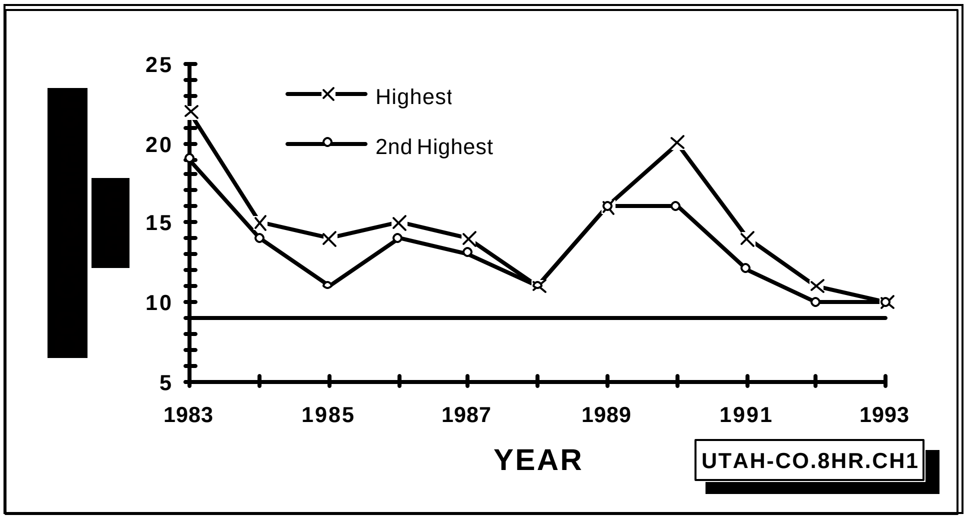


Figure IX.C.8

NUMBER OF CO EXCEEDANCES / YEAR

UTAH COUNTY

UNIVERSITY AVENUE #2 SITE

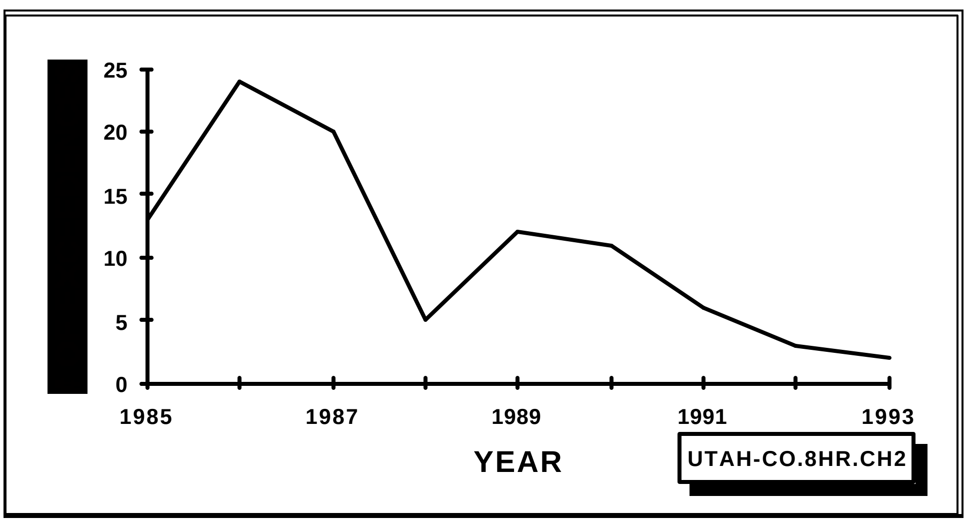
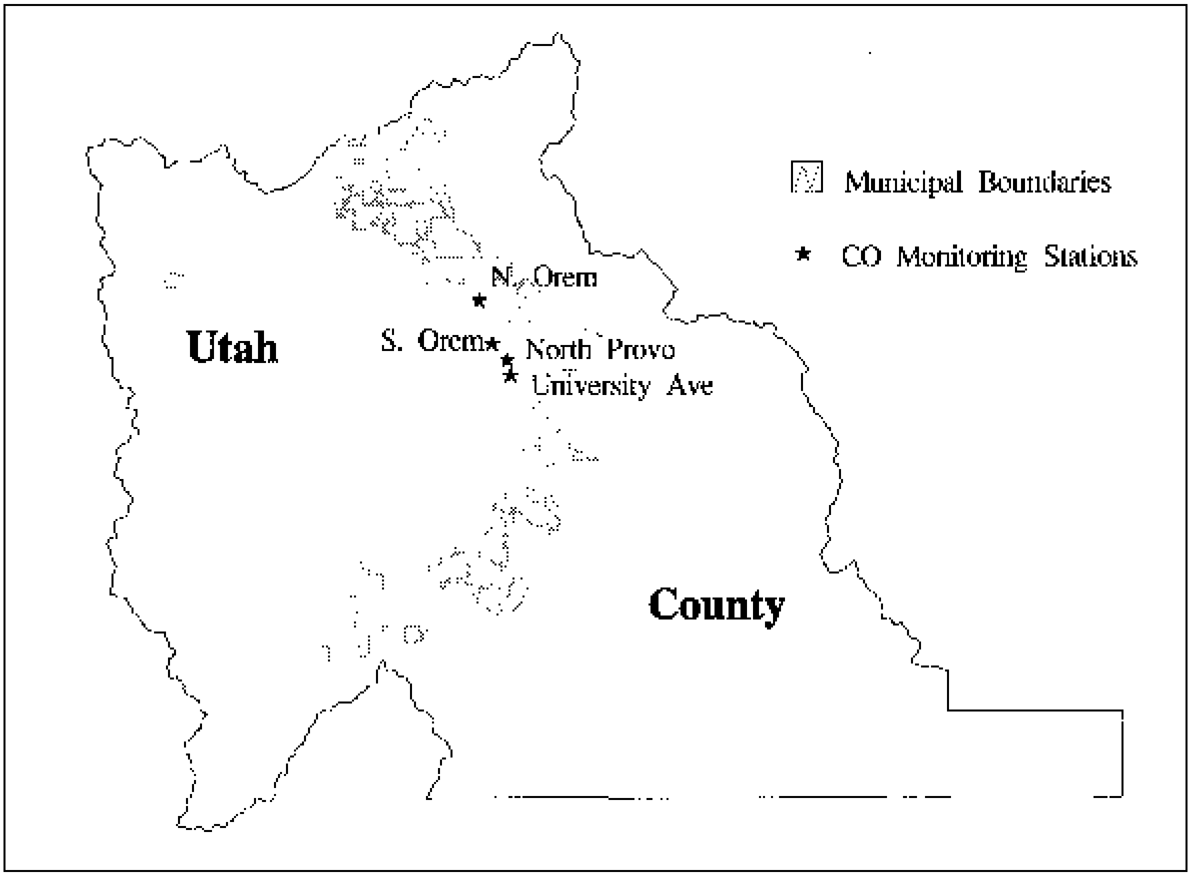


Table IX.C.9
SLAMS MONITORING SITES
UTAH COUNTY

COMMON NAME	SITE CODE	AIRS CODE	SAROAD NUMBER
North Provo	NP	49-049-0002	460800002F01
University Avenue #2	UA	49-049-0004	460800004F01
American Fork	AF	49-049-5003	inactive
North Orem	NO	49-049-5004	seasonal
South Orem	SO	49-049-5005	seasonal
Springville #1	SV	49-049-5006	inactive

Figure IX.C.9
MONITORING SITES
UTAH COUNTY



The design value is the value used to determine the attainment status and non-attainment designation of an area (i.e., moderate or serious non-attainment) as defined in Section 186(a) of the Act. In accordance with the Act, the design value used for this SIP is the highest second-high eight-hour concentration observed in 1988-1989.

Based on the data contained in Table IX.C.8 for 1988 and 1989, the design value of the Provo/Orem non-attainment area is 15.8 ppm. Therefore, according to Section 186(a) of the Act, the Provo/Orem non-attainment area is a moderate non-attainment area with a mandatory attainment date of December 31, 1995.

As determined by a review of the emissions inventory, 68% (sixty eight percent) of the carbon monoxide (CO) emitted is generated by vehicles. Therefore, the current CO monitoring network is designed primarily to monitor the impact from mobile sources.

The only significant point sources for CO in Utah County are the Geneva Steel mill and Pacific States Cast Iron Pipe Company. In 1991, Geneva modified its operations by eliminating its open hearth furnaces and installing basic oxygen furnaces (Q-BOP). Carbon monoxide monitors were located at the Geneva Dispensary and Lindon stations to verify that the new Q-BOP did not cause a violation of the NAAQS. Although no exceedances of the NAAQS were monitored, data collected at the Lindon Station indicated an increase in CO concentrations from that which had been measured there historically. However, the data collected over three winter seasons show the NAAQS has not been exceeded at the Lindon Station.

The monitoring network in Utah County has been changed in the recent past. The Division has been involved in determining how large the CO non-attainment area is in Utah County. In the fall and early winter of 1991 four additional CO monitoring stations were installed in Utah County. The stations were located in North Orem, South Orem, American Fork, and Springville. After 2 winter seasons of monitoring, no violations of the NAAQS were observed at any of these additional sites. It should be noted that the winters of 1992/1993 and 1993/1994 were comparably mild, and the meteorology was not conducive to the formation of strong inversions which usually produce exceedances of the standard. The South Orem station equaled the standard with a 9 ppm eight-hour average. The American Fork and Springville stations have been removed. A combination of CO monitoring and modeling shows the non-attainment area to include the cities of Provo and Orem in Utah County. The state will meet the requirements of 40 CFR Part 58 and gain EPA approval before any additional changes are made to the Utah County CO monitoring network.

When Utah's CO network was designed, no modeling data was available to assist in site location, so sites were chosen based on traffic volumes and traffic patterns. This site selection method was used because it is generally accepted that CO has very localized impacts. Since that time, modeling has been performed for the Provo-Orem area in Utah County. The models verify the original site selections, and indicate that existing CO monitoring stations are appropriately located to determine mobile source impacts on CO.

Based on the monitoring data discussed in this section, as well as the modeling results as discussed in Section IX.C.6.k, and considering the effectiveness of the various control strategies as is discussed in Section IX.C.6.j, the state has determined that the actual area of non-attainment is the area within the city limits of Provo and Orem. This is primarily because, as shown in **Figure IX.C.18** on page 60, the modeling indicates that exceedances of the NAAQS do occur in both Provo and Orem City. It is also much easier to enforce a wood-burning control program (See Section IX.C.6.j, Control Strategies, on page 34) within a specific political boundary. As either city boundary changes, it is the intent of this plan that the non-attainment area will be expanded to include the new city boundary. Legal descriptions of the city boundaries are contained in data maintained by the Utah County Information System Center.

The state is required to demonstrate that the control strategies will be in effect during the time in which violations of the standard are expected to occur. This is accomplished by using monitoring data from the most recent five-year period to determine when violations of the standard are likely to occur. Based on the data summarized in Table IX.C.8, a control period from November 1 through March 1 would cover the dates when all violations of the standard occurred during the five years prior to the development of this SIP. Because the oxygenated fuels program and wood-burning control program run during that same time period and the Enhanced I/M program is year-round, the requirement that the control strategies be in effect during the time in which violations of the standard are expected to occur is met with the control strategies discussed in Section IX.C.6.j. However, since an exceedance of the standard is defined in terms of a calendar year, the seasonal controls should be understood to be in place from January 1 through March 1 and November 1 through December 31 of each year.

c. County-Wide Base-Year Emissions Inventory

A comprehensive base-year inventory of CO from point, area, and mobile sources was completed as required under 187(a)(1) of the Act, and to support development of the emissions inventory needed to model the attainment demonstration in Section IX.C.6.k. All emission estimates were based upon actual emissions in accordance with guidance provided by the EPA, and followed procedures outlined in the Inventory Preparation Plan (IPP) approved by Region VIII of EPA and included in the Technical Support Document.

All emissions were reported in both tons per year (TPY) and tons per peak CO season day (TPD) for the entire county as agreed upon in a governor's letter to EPA. Tons per day calculations are based on typical wintertime conditions when Utah's CO levels can be expected to be highest. This time period, referred to as the "peak CO season," is defined through analysis of historical CO ambient monitoring data as described in EPA's "Emissions Inventory Requirements For Carbon Monoxide State Implementation Plans", EPA-450/4-91-011, 3.3.1, Peak CO Season. Utah's peak CO season is a three-month period from November 1st to January 31st, which is a subset of the control period. A description of the analysis used to define Utah's peak CO season was contained in the original IPP reviewed by EPA, and is included in the technical support document with the Utah County emissions inventory.

(1) Point Sources

Point source estimates of CO were developed for Pacific States Cast Iron Pipe Company (Pacific States) and Geneva Steel in Utah County for the Base-Year 1990 for both reporting and modeling purposes. The two companies were selected based on reports submitted to the State by installations that emit 10 tons per year or more of any one criteria pollutant, or 25 tons per year or more of any combination of pollutants. Geneva Steel and Pacific States each emitted more than 100 tons of CO in 1990, which is the cut-off for point sources included in the CO SIP. No other installation in Utah County emitted more than 100 tons of CO in 1990. Stationary sources emitting less than 100 tons per year of CO were included in the area source inventory for Utah County.

Information in the inventory questionnaires and subsequent correspondence was used to estimate the annual CO emissions, the typical winter day CO emissions and the gram/second CO emissions. All calculations can be found on pages 7-15 through 7-112 in the emission inventory Technical Support Document.

The emission inventories for each of the sources have been reviewed by EPA. Geneva Steel emitted 35849.31 tons in 1990 and Pacific States emitted 7278.62 tons in 1990.

The contribution from Geneva is as follows:

The Sinter Plant was the source of 92.6% of the CO emitted at the entire Geneva Steel facility in 1990. The Blast Furnace produced 4.3% and the remaining 5 sources (Coke Plant, Power House, Rolling Mill, Open Hearth and Vehicle Traffic) produced the last 3.1% of CO emitted at Geneva Steel in 1990. Following is a discussion of the procedures used in calculating the annual and daily emissions at the major sources (the Sinter Plant and the Blast Furnace) for 1990 (See the Technical Support Document: "Response to EPA comments concerning Geneva Steel Portion of the 1990 Base-Year and 1996 Projection-Year Emission Inventories for Provo Carbon Monoxide SIP," December 6, 1993 (DAQT-173-

93); Technical Support Document, Part I, and "Basis for Geneva's Sinter Plant and Blast Furnace Bells CO Emissions", December 16, 1993 (DAQT-181-93)).

Sinter Plant

The 1992 tracer study stack test data represented the most accurate data for CO emitted from the Sinter Plant in 1990. The test data show that the average CO concentration was 11,000 ppm (1.1%) and the average flow-rate was 147,258 dscfm, which are the numbers used for the seasonal inventory. As for the modeling base-year inventory, 971 g/sec was the highest average eight-hour rate at the North Stack, and 990 g/sec was the highest average eight-hour rate at the South Stack.

Blast Furnace

Each blast furnace is equipped with an upper bell and a lower bell. A skip goes up and dumps into the upper bell; and with each skip, the upper bell dumps into the lower bell. The lower bell dumps into the furnace after every three skips. The lower bell dumps twice per charge. Therefore, there are six skips per charge.

The CO calculation for the Blast Furnace bells is based on the number of charges that occured in 1990 at both blast furnaces. The calculation accounts for all skips/charges at both blast furnaces.

Pacific States' cupola accounts for 99.6% of their total CO emissions. The calculations are based on the amount of metal charged in the cupola.

The point source emission estimates include emission reductions realized from control measures that are already implemented. No rule effectiveness was used in the point source inventory due to the absence of any rules to control CO adopted by the state. Rule effectiveness is a measure of the ability of the regulatory program to achieve all of the emission reductions possible by full compliance with the applicable rules at all covered sources, at all times. It reflects the assumption that rules are not 100 percent effective at all times. In 1990, however, no rules applied. In the future, if rules are developed and become applicable, the State has the option of conducting Rule Effectiveness Studies to verify the compliance rate in Utah for various rules, and will continue conducting such studies as resources allow and will change the emissions inventory to reflect the results of those studies.

(2) Area Sources

The area source portion of this inventory includes all stationary CO producing activities that are not included within the stationary point source inventory. These area sources represent a collection of many small emission points which individually emit less than 100 tons of CO annually, but which may collectively as a single category emit more than 100 tons annually. For example, a single woodstove emits much less than 100 tons annually, but all of the woodstoves in the area emit more than 3500 tons annually. The area and point source inventories were examined for overlap and double-counting and adjusted accordingly. All emission estimates in the area source inventory were reported in tons per year (TPY) and tons per season day (TPD, November 1 - January 31) to reflect conditions typical of higher CO concentrations. Under the guidance of EPA Region VIII and an EPA document entitled "Procedures for Emission Inventory Preparation, Volume III: Area Sources", EPA-450/4-81-026c, emissions were estimated for the 1990 base-year. Details of the emissions calculations for each of the following area source categories can be found in the corresponding section of the Technical Support Document.

(3) Mobile Sources

The mobile source inventory is divided into two categories, on-road and non-road. On-road sources include all exhaust emissions from on-road vehicles: diesel and gasoline-fueled cars, trucks, and motorcycles. Non-road sources include exhaust emissions from railroads, planes, snowmobiles, snow blowers, and mining and construction equipment.

(a) On-Road Mobile

The on-road emissions inventory was generated by combining CO emission factors with estimates of vehicle miles traveled (VMT) within the county. All emission estimates are reported in tons per CO season week day and tons per year.

The emission factors were derived from EPA's mobile source computer model, MOBILE5a. This software incorporates the current federal tailpipe standards as well as those required in the Act, and allows users to input local parameters for vehicle control programs already in place or planned for future years. All MOBILE5a parameters involving the inspection and maintenance (I/M) and the anti-tampering program (ATP) were measured, estimated, or confirmed by the Utah County Health Department, who oversee the inspection and maintenance program within the county.

All vehicle speeds were estimated by the Utah Department of Transportation (Utah DOT) in cooperation with the local metropolitan planning organization, MAG. The Highway Performance Monitoring System (HPMS) formed the basis for VMT contained in the Utah DOT report entitled, "1990 VMT by County, City, and FC," which is contained in the Technical Support Document.

(b) Non-Road Mobile

The non-road mobile inventory calculates and declares emissions from railroads, commercial and private aircraft, and a variety of specialized maintenance and construction equipment. The three major categories are: 1) railroads, 2) aircraft, and 3) miscellaneous non-road engines.

1) Railroads

Three railroad companies operated within the boundaries of the nonattainment area in 1990: Union Pacific Railroad, the Denver and Rio Grande Western Railroad, and Utah Railways. Each company submitted a written report of their annual locomotive fuel consumption within the nonattainment area. Local rail yard managers were interviewed to apportion fuel consumption between yard and line-haul activities. EPA guidance document entitled "Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources" (hereafter referred to as "Volume IV"), Section 6.0, provided emission factors and general guidance to calculate daily and annual rail-related CO.

2) Aircraft

The Mountainlands Association of Governments (MAG) and the Wasatch Front Regional Council (WFRC) jointly studied and summarized the airport activities of commercial and private aircraft at each airport statewide. Their study included the Provo Municipal Airport, the only airport within the nonattainment area. Their summary report identifies takeoff-and-landing (LTO) cycles within specific aircraft size and use categories. With the assistance of EPA's FAA Aircraft Engine Emission Database (FAEED) software package and Section 5.0 of Volume IV, UDAQ calculated aircraft-related CO emissions.

3) Miscellaneous Non-Road Engines

This category covers all CO emissions from vehicles and other engines utilized in agricultural, logging, light commercial, industrial, construction, airport services, recreational sports and marine activities. Energy and Environmental Analysis, Inc. (EEA), a consultant for EPA, studied the non-road engine activity within Utah County and 32 other metropolitan areas nationwide.

To construct the non-road inventory, EEA estimated several factors including (a) equipment populations in each nonattainment area, (b) annual and seasonal hours of use of each type of equipment, (c) average rated horsepower of each type of equipment, (d) typical load factors for each type of equipment, and (e) an emission factor for each of the 79 categories of equipment.

EEA accessed commercial and public records in several of these nonattainment areas to compile an inventory they entitled "Inventory A". A second EEA inventory accessed confidential industry-supplied records to generate an inventory they entitled "Inventory B". Overall, there is reasonably close agreement between these two inventory approaches. Following EPA counsel, the State selected the inventory that EEA entitled "Inventory (A+B)/2", which is a simple average of the results of the two inventory methods.

Annual countywide emissions from area, mobile, and point sources for the 1990 base-year inventories are summarized in Table IX.C.10. **Figure IX.C.10** and **Figure IX.C.11** show the relative source contributions to the total CO inventory on a daily and annual basis, respectively. It should be noted that, because the activities which produce CO and other factors are different in summer months, the annual emissions summary is slightly different from the daily summary.

Table IX.C.10
BASE-YEAR (1990) CO EMISSIONS INVENTORY
UTAH COUNTY

Area Sources		Tons/Year	Tons/Day
Stationary External Combustion	**Orchard Heaters**	N/D	N/D
	Woodburning/Fireplaces	3847.44	22.35
	Coal - Residential	815.64	3.80
	Coal - Commercial	2.51	Neg
	Coal - Industrial	PT/S	PT/S
	Gas - Residential	80.28	0.29
	Gas - Commercial	12.36	0.05
	Gas - Industrial	52.51	0.26
	Oil - Residential	1.03	Neg.
	Oil - Commercial	1.18	Neg.
	Oil - Industrial	14.72	0.05
Waste Disposal	**Incineration - Com/Ind**	130.07	0.36
Miscellaneous Sources	**Forest Fires**	71.39	N/D
	Fire-fighting Training	Neg.	Neg.
	Structural Fires	0.32	Neg.
	Prescribed Burning/Slash Burning/Agricultural Burning	3396.47	N/D
	Open Burning/	0.54	N/D
	Detonation	5.90	0.02
	Aircraft/Rocket Engine Firing & Testing	2.79	0.01
	Charcoal Grilling	N/I	N/I
Mobile Sources			
On-Road	**On-Road**	120522.05	353.23
Non-Road	**Aircraft**	278.51	0.71
	Railroads	213.89	0.59
	Misc Non-Road Equipment	3746.00	3.15
Point Sources			
Geneva Steel		35849.31	108.14
Pacific States Cast Iron Pipe Company		7278.62	37.10
Total CO Emissions - Utah County		176323.53	530.11

PT/S =Reported as a point source.. N/A =Not applicable.
N/I= No info available N/D =Negative declaration Neg =Negligible amount.
Number may vary slightly from report due to rounding. Numbers may not add due to rounding.

Figure IX.C.10

BASE-YEAR CO EMISSIONS INVENTORY

UTAH COUNTY

DAILY EMISSIONS SUMMARY

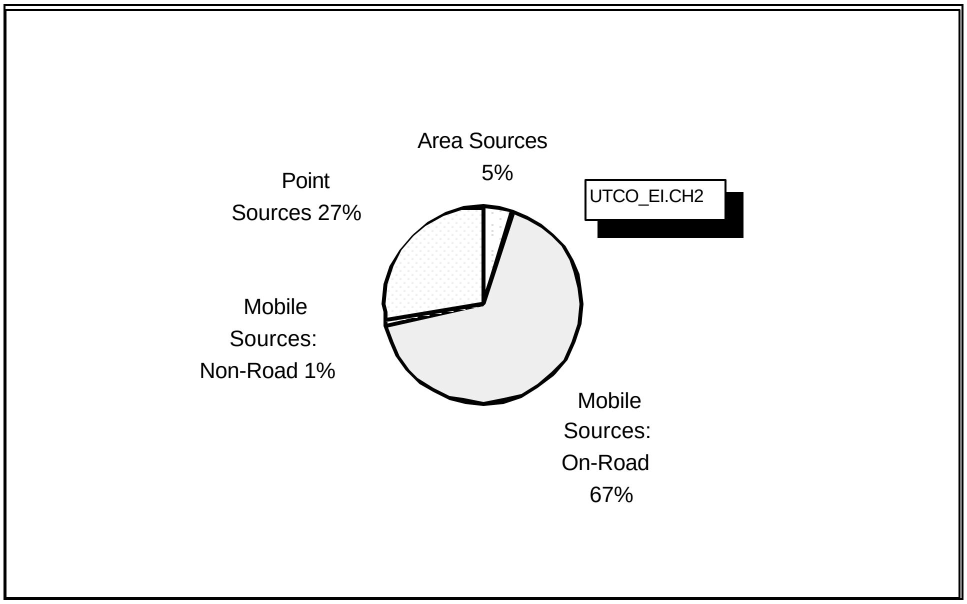
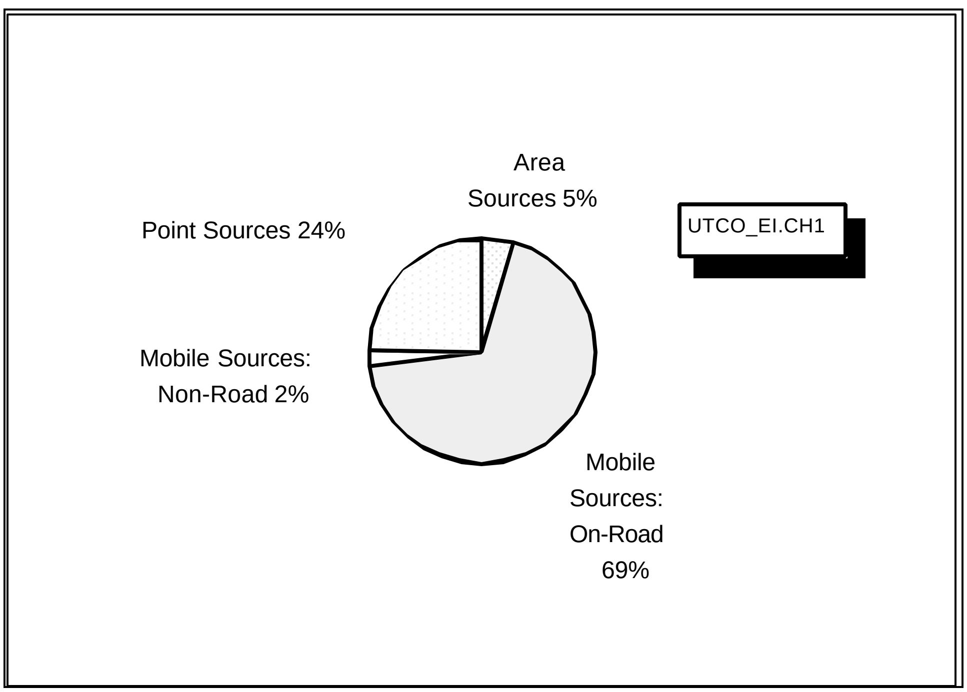


Figure IX.C.11

BASE-YEAR CO EMISSIONS INVENTORY

UTAH COUNTY

ANNUAL EMISSIONS SUMMARY



d. County-Wide Projected Emissions Inventory

(1) Point Sources

The 1996 emission projections are the result of projected growth estimates made by the companies themselves with the review and concurrence of the state. Projected CO emissions at Pacific States are based on the tons of pipe projected to be produced by Pacific States in 1996. Projected CO emissions at Geneva Steel are based on average maximum rates that **could** occur in 1996, which explains the increase of almost 300% in Geneva's emissions from 1990 to 1996. The projections do not incorporate growth that may occur as Utah County attracts new industries that emit CO.

Pacific States is projected to emit 7,654.00 tons in 1996, and Geneva Steel is projected to emit 96,359.03 tons in 1996. The calculations for these projections can be found in Section 7 of the Technical Support Document for the projected CO inventory for Utah County.

The contribution of the different sources at Geneva Steel are as follows:

The projection-year inventory incorporates the addition of the Quelle Basic Oxygen Process furnace (Q-BOP) in 1991 and the subsequent removal of the Open Hearth. The Q-BOP was installed as a significant control strategy for the PM_{10} section of this SIP, but was also reviewed as a new source of CO. That review process determined that Geneva applied the best control available for CO emissions from the Q-BOP, such that no new violations of the NAAQS would result from its installation; therefore, an approval order was granted by the Air Quality Board. As a result, in the projection-year inventory, the Sinter Plant comprises 80%, the Q-BOP 16.3%, the Blast Furnace 2.3% and the remaining plant 1.4% of the total CO projected as the worst case scenario of CO emissions that could be expected to occur at Geneva Steel in 1996.

The projection methods used to estimate the CO emissions at the Sinter Plant, the Blast Furnace and the Q-BOP are as follows:

Sinter Plant

The 1992 tracer study stack test data was the basis for the projection-year emission estimates. The maximum one-hour average CO concentration was 13,800 ppm (1.38%). The maximum flow-rate of 306,822 dscfm is based on the design capacity flow-rate, which can be found in the Sinter Plant baghouse NOI dated November 1992. These numbers were the basis for the 1996 annual and seasonal inventory.

Blast Furnace

The CO calculation for the Blast Furnace bells is based on the number of charges that could occur in 1996 at both blast furnaces. The projection-year emissions are based on the maximum number of charges that could occur at both blast furnaces. The system could not handle more than those proposed for 1996.

Q-BOP

Highest one-hour emissions rate is based on the fact that Geneva is not prohibited by their UDAQ permit from operating two Q-BOP's simultaneously. Thus, Geneva used a factor of 8,784 heats/yr for each collection system at the Q-BOP. In order to compensate for the possibility of running both Q-BOPs at the same time, Geneva projected 2 heats/hr in their calculations, which resulted in the 8,784 heats/yr per unit or 17,568 heats/yr total for the system. In addition, Geneva used a 98.5% efficiency factor for the flare-on scenario.

It is possible to have two oxygen blow steps, or parts of two oxygen blow steps, of the cycle within the same hour with only one operational Q-BOP. The other scenario in which two heats may occur in the same hour is when one Q-BOP is being shut down and the other Q-BOP is being brought on line. However, the oxygen plant and the waste-water treatment facilities at Geneva are not designed to handle the capacity of running two Q-BOPs simultaneously for long periods. As a result, to propose that the highest one-hour emission rate would occur during a two-heat per hour scenario at the Q-BOP would be an accurate assessment.

(2) Area Sources

The 1996 area source emission projections are based on documented trends of growth or decline within each of twenty categories of emissions. These trends are applied to 1990 area source emission levels to produce the 1996 projected emissions. Indicators of these trends are identified and documented within the projection inventory Technical Support Document, Section 5.

Future emissions for the majority of these twenty categories are projected based on expected growth of residential population or employment demands. Since both of these indicators are expected to increase from 1990 to 1996, the corresponding emissions from each category impacted by these indicators increase proportionally. Only the category labeled "woodburning/fireplaces" is shown to decrease due to the effects of a woodburning curtailment rule and its accompanying rule effectiveness factor.

All twenty categories are identified below in Table IX.C.11, along with the factor or factors leading to their increase or decrease.

Table IX.C.11
PROJECTION-YEAR AREA SOURCE GROWTH JUSTIFICATION
UTAH COUNTY

AREA SOURCE CATEGORY	**PROJECTION CRITERIA**
Orchard Heaters	Their use is zero, or negligible, during the winter months.
Woodburning/Fireplaces	Projections are based on anticipated residential population, a woodburning curtailment rule, and a rule effectiveness factor.
Coal, Residential	Projections are based on residential population trends.
Coal, Industrial	Projections are based on industrial employment trends.
Gas, Residential	Projections are based on residential population trends.
Gas, Industrial	Projections are based on industrial employment trends.
Gas, Commercial	Projections are based on commercial employment trends.
Oil, Residential	Projections are based on residential population trends.
Oil, Commercial	Projections are based on commercial employment trends.
Oil, Industrial	Projections are based on industrial employment trends.
Incineration	Projections are based on residential population trends.
Forest Fires	Projections based on ten-year average forest fire history held constant.
Fire Fighting Training	Emissions were examined and shown to be negligible.
Structural Fires	Projections are based on residential population trends.
Prescribed Burning, Slash Burning, Agricultural Burning	Projections are held constant at 1990 levels.
Open Burning	Present rules require a permit to burn. No permits are issued November through January.
Open Detonation	Projections are based on survey results from Trojan Corporation.
Aircraft Engine Firing and Testing	Projections are based on anticipated airport activity.
Rocket Firing and Testing	Projections are completely covered under point source emissions. This activity does not occur as an area source.
Charcoal Grilling	This activity is negligible during winter months.

(3) Mobile Sources

The projections for each mobile source category were completed separately; on-road mobile, railroad, aircraft, and miscellaneous non-road equipment. Railroad, aircraft, and miscellaneous non-road equipment comprise the "non-road" category in the base-year inventory. Each is based on a different set of indicators. All available projection indicators were examined and the quality of each indicator was assessed.

On-road mobile source emission estimates are the combination of MOBILE5a emission factors and VMT projections. VMT projections were made by the MAG. MAG's projections follow a smooth flow from historic VMT data reported in the Highway Performance Monitoring System (HPMS). MAG applied a projected VMT growth of about 5.2% compounded annually (averaged over the entire county and various functional classifications) from 1992 through 1996. Historic pre-1993 VMT data is documented and available for review within the HPMS.

Projected railroad emissions are 1990 emissions multiplied by an industry growth factor. This growth factor, documented in "Economic and Demographic Projections, 1992" (Utah Office of Planning and Budget: May, 1992), is a measure of employment growth within the Transportation, Communications, and Public Utilities sector.

Aircraft emissions are the combination of default general aviation emission factors and LTO (Landing and Take Off) projections. The default emission factors were used over FAEED emission rates at the recommendation of EPA since no data is available for specific aircraft types, necessary for the use of FAEED, to associate with the LTO data. These LTO projections, calculated by WFRC, are documented in chapter 5 of the May 1993 edition of the "Metropolitan Salt Lake City Airports System Plan". WFRC's projections follow a smooth and logical flow from historic LTO data.

All four categories are identified in Table IX.C.12 with the factor or factors leading to their increase or decrease.

The projection-year county-wide emissions inventory summary is contained in Table IX.C.13. **Figure IX.C.12** and **Figure IX.C.13** show the relative source contributions to the total projected CO inventory on a daily and annual basis, respectively.

Table IX.C.12
PROJECTION-YEAR MOBILE SOURCE GROWTH JUSTIFICATION
UTAH COUNTY

MOBILE SOURCE CATEGORY	PROJECTION CRITERIA
On-road Vehicles	Projections are based on MOBILE5a emission factors and MAG's VMT. Emission factors include the impacts of a proposed enhanced vehicle inspection and maintenance program, wintertime oxygenated fuels, and continuous vehicle fleet turnover.
Aircraft	Projections are based on WFRC's airport activity and FAEED emission factors.
Railroad	Projections are based on employment growth in the transportation, communications, and public utilities sector.
Misc Non-Road Equipment	Projections are based on residential population growth.

Table IX.C.13
PROJECTION-YEAR CO EMISSIONS INVENTORY
UTAH COUNTY

AREA SOURCES		**Tons/Year**	**Tons/Day**
Stationary External Combustion	Orchard Heaters	N/D	N/D
	Woodburning/Fireplaces	4270.92	9.92
	Coal - Residential	905.42	1.69
	Coal - Commercial	2.83	Neg
	Coal - Industrial	PT/S	PT/S
	Gas - Residential	89.1	0.30
	Gas - Commercial	13.96	0.06
	Gas - Industrial	59.33	0.29
	Oil - Residential	1.14	Neg.
	Oil - Commercial	1.33	Neg.
	Oil - Industrial	16.64	0.06
Waste Disposal	Incineration - Com/Ind	144.39	0.40
Miscellaneous Sources	Forest Fires	1180.12	7.71
	Fire fighting Training	Neg.	Neg.
	Structural Fires	0.36	Neg.
	Prescribed Burning/ Slash Burning/ Agricultural Burning	3396.5	N/D
	Open Burning/ Detonation	0.6 6.49	N/D 0.03
	Aircraft/Rocket Engine Firing / Testing	3.04	0.01
	Charcoal Grilling	N/I	N/I
Mobile Sources			
On-Road	On-Road	81285.94	189.72
Non-Road	Aircraft	304.25	0.77
	Railroads	249.15	0.69
	Misc Non-road Equipment	4158.00	3.50
Point Sources			
	Geneva Steel	96359.03	274.61
	Pacific States	7654.00	34.08
TOTAL CO EMISSIONS - UTAH COUNTY (1996)		200102.54	523.85

PT/S = Reported as a point source. N/D = Negative declaration. N/A =Not applicable.
N/I = No Information currently available. Neg = Negligible amount.
Numbers may vary slightly from report due to rounding. Numbers may not add due to rounding.

Figure IX.C.12
PROJECTION-YEAR CO EMISSIONS INVENTORY
UTAH COUNTY
DAILY EMISSIONS SUMMARY

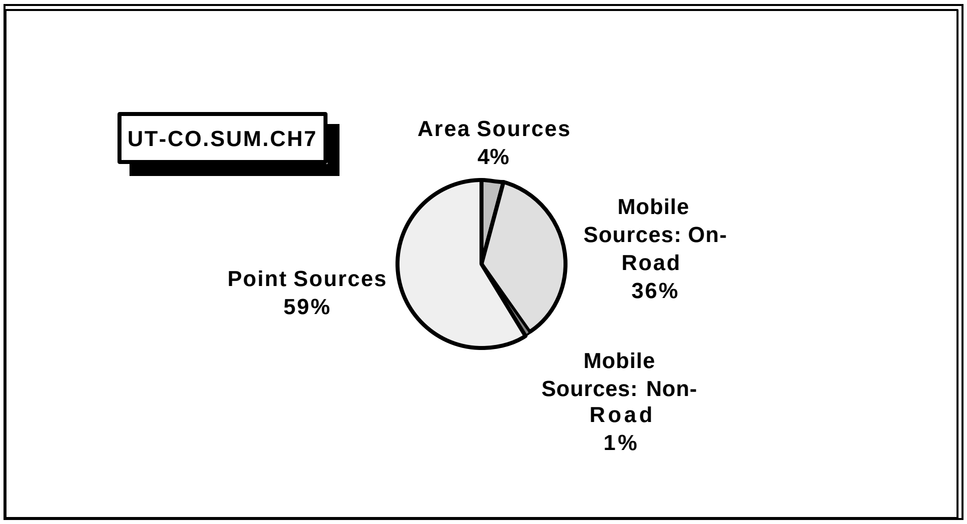
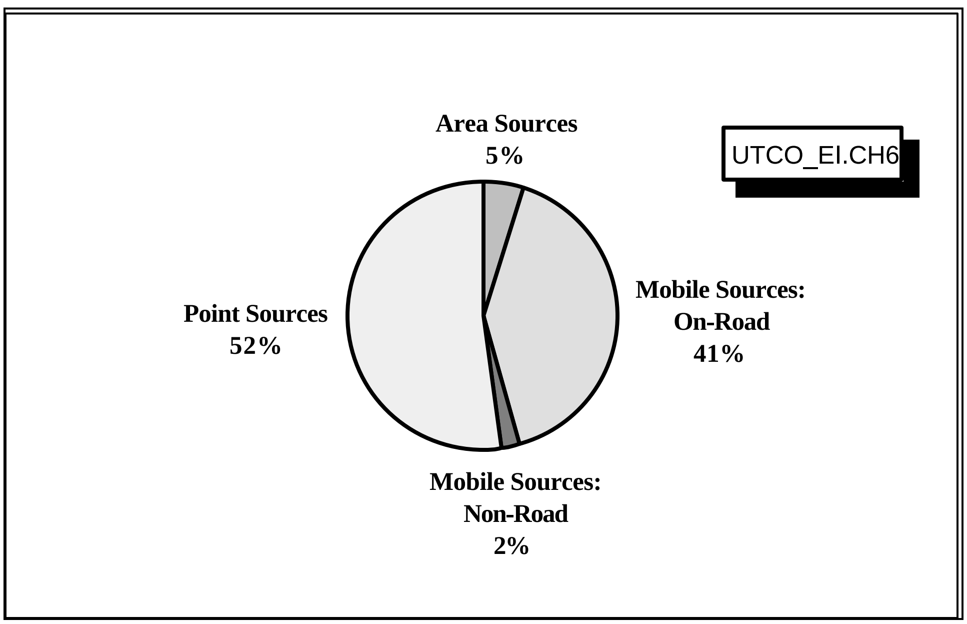


Figure IX.C.13
PROJECTION-YEAR CO EMISSIONS INVENTORY
UTAH COUNTY
ANNUAL EMISSIONS SUMMARY



e. Projected Vehicle Miles Travelled

Section 187(a)(2) of the Act (42 U.S.C. 7512a(a)(2)) requires the state to submit a table of the VMT projections which will be used to demonstrate that the state is making reasonable further progress towards attaining the NAAQS. The local metropolitan planning organization, Mountainlands Association of Governments (MAG), and the Utah Department of Transportation (UDOT), who are responsible for the development of long-range transportation plans and Transportation Improvement Plan (TIPs), submitted the VMT projections contained in Table IX.C.14 for the gridded modeling domain which contains the non-attainment area, and are committed to meeting them in the appropriate plans and TIPs. As discussed in Section IX.C.6.c(3) and IX.C.6.d(3), vehicle speeds were estimated by the UDOT in cooperation with MAG. The Highway Performance Monitoring System (HPMS) is used in conjunction with vehicular count data to derive VMT for each road link (or section of roadway) and functional class across the network. (See UDOT's report in the Technical Support Document: "1990 VMT by County, City, and F.C.") These historical VMT numbers were then projected into the future by MAG using a smooth extrapolation. Based on this extrapolation, MAG found that VMT could be expected to grow at a rate of about 4.1% across the modeling domain (which covers the non-attainment area) compounded annually from 1992 through 1996. These VMT forecasts are similar to those used in calculating the PM10 emissions in Section IX.A of this SIP. As the PM10 SIP is revised, any differences will be resolved.

As required by the Act, the state will, by September 30 of each year, provide EPA with a report of actual VMT for the preceding calendar year for the Provo/Orem non-attainment area following procedures meeting guidance provided by EPA. These reports will be provided by MAG to the state based on HPMS data provided by UDOT. The reporting area will be identical to that provided by UDOT to UDAQ for the attainment demonstration modeling. MAG will develop revised forecasts each year in accordance with procedures outlined by EPA, and these revised forecasts will be provided to EPA by the State with the report of actual VMT.

Table IX.C.14
ESTIMATED VMT FOR ON-ROAD VEHICLES
MODELING DOMAIN AREA

Functional Class	Actual HPMS Data	Projected VMT			
	1990	**1993**	**1994**	**1995**	**1996**
Total Daily	4215727	4757183	4952703	5156259	5369736
Total Annual	1411688399	1593232132	1658794016	1727053788	1798122466

f. Contingency/Stop-Gap Measures

(1) Events which trigger contingency measures.

(a) As is discussed in Section IX.C.6.j, the state is proposing to implement an Enhanced vehicle inspection and maintenance (I/M) program beginning no later than July 1, 1995, (or an equivalent automotive improvement program that results in emission factors equal to or less than the emission factors in Table IX.C.23) to demonstrate attainment of the NAAQS. If the Enhanced I/M program is implemented after January 1, 1995, there will be insufficient emissions reductions from the program alone to make the attainment demonstration. That is because, under the present system it will take a full year for the entire vehicle fleet to undergo the

Enhanced I/M program. Therefore, if the Enhanced I/M program is implemented after January 1, 1995, (or if an alternative program does not result in emission factors equal to or less than the emission factors in Table IX.C.23), for the winter of 1995/1996, and subsequent control periods, the average oxygen content requirement for gasoline sold in the Provo/Orem MSA will be increased to 3.1% oxygen by weight until the next full control period after either all subject vehicles have been inspected by the Enhanced I/M program at least once, or other automotive improvement programs are in place that meet equivalent emission reductions. An Enhanced I/M program or other automotive improvement programs must be at least equivalent to the mobile source emission factors in the matrix contained in Table IX.C.23. However if alternative control measures are identified that will achieve the emission reductions necessary to attain and maintain the NAAQS, the state will revise the SIP. The average oxygen by weight standard for the oxygenated gasoline program will be reduced to 2.7% after the county is able to meet the emission factors contained in Table IX.C.23 on page 66. This is not the state's preferred option, and is included only to provide the county with time to implement the Enhanced I/M and/or automotive emissions control programs.

(b) Section 187(a)(3) of the Act (42 U.S.C. 7512a(a)(3)) requires that this Plan include contingency measures to be undertaken if the actual vehicle miles traveled (VMT) exceeds the number predicted in the most recent prior forecast (see table IX.C.1). Actual VMT which exceed the projections as outlined in EPA's Section 187 VMT Forcasting and Tracking Guidance dated January 1992 and the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, trigger the implementation of contingency measures.

(2) Contingency Measures

As a contingency measure, along with the adoption of this SIP, the Utah Air Conservation Rules have been changed to implement the oxygenate requirement, and to require that, within 60 days of the triggering of the contingency measures, only gasoline with an average oxygen content of 3.1% oxygen by weight will be sold in the Provo/Orem MSA during the oxygenated gasoline control period as defined in the rules of the Air Quality Board until it is shown to be unnecessary in the maintenance demonstration provided for in Section 175A(a) of the Act or until it is replaced with other control measures in a SIP revision that demonstrates attainment with the NAAQS. If the state identifies a contingency measure in the future which can result in a documentable equivalent emission reduction, this SIP will be revised to delete this 3.1% oxygen by weight contingency measure and replace it with the equivalent measure.

The amount of reduction in CO varies depending on the VMT, the specifications of the Enhanced I/M program in effect, temperature, speed, relative market share of each of the oxygenates, etc. However, **as an example**, the MOBILE5a model shows that, for 1996, the emission factor for 30 mph at 47.5 degrees F (temperature derived using T_{max} and T_{min} in the Mobile Model) will be reduced by about 4.5% by going from a 2.7% program to a 3.1% program. While the emission reduction from the overall fleet will not be exactly 4.5%, it will be of a similar magnitude depending on the many variables listed above. If the contingency measure is triggered in 1996, and the oxygen by weight standard is increased from 2.7% to 3.1%, the amount of reduction realized would be 9.81 tpd, which equates to approximately 5% of the on-road emissions. Because the VMTs are growing at approximately 4.1%, and the resulting emissions are not growing as rapidly, the reduction obtained is more than one-year's growth in the on-road emissions as required by EPA. The documentation for this reduction is contained in the Technical Support Document.

The state and county are concerned with the possible impact which increasing the oxygenate content might have on the NO_x emissions from motor vehicles, and therefore on PM_{10} concentrations. As is detailed in the Technical Support Document, increasing the oxygenate content to 3.1% by weight would result in less than a 1% increase in tailpipe emissions of NO_x, and the implementation of Enhanced I/M will result in approximately an 11% reduction in tailpipe emissions of NO_x, which more than compensates for NO_x increase resulting from the increased oxygenate. Any alternatives to Enhanced I/M provided by other automotive emissions control programs must include controls to offset any estimated NO_x increase resulting from implementation of the oxygenated gasoline program.

(3) Trigger mechanism

(a) If triggered under the provisions of IX.C.6.f(1)(a)- (EIM Requirement)

The contingency measures will become effective as per IX.C.6.f(1)(a) if the Enhanced I/M program required in IX.C.6.j is implemented after January 1, 1995, or if an alternative program does not result in emission factors equal to or less than the emission factors in Table IX.C.23. For the winter of 1995/1996, and subsequent control periods, the average oxygen content requirement for gasoline sold in the Provo/Orem MSA will be increased to 3.1% oxygen by weight. This requirement will remain in effect until the next full control period after either all subject vehicles have been inspected by the Enhanced I/M program at least once, or other automotive improvement programs are in place that result in equivalent emission reductions.

(b) If triggered under the provisions of IX.C.6.f(1)(b)- (VMT Requirement)

Section 187(a)(3) of the Act (42 U.S.C. 7512a(a)(3)) specifies, if triggered by excess VMTs, the contingency measures shall "...take effect without further action by the State or the Administrator...." Updating of VMT projections occurs annually in reports of prior year actual measurements provided to the UDAQ and EPA by the Utah DOT and MAG. The contingency measures will become effective within 60 days after submittal by MAG of an annual report of actual VMTs documenting excess VMTs for the preceding calendar year for the Provo/Orem non-attainment area which has been prepared following procedures meeting guidance provided by EPA.

(c) If triggered by non-attainment of the standard

The contingency measures will become effective within 60 days after EPA has notified the state that the attainment date specified in the Act has not been met.

As a means of documenting the Mobile Source Emissions Cap established for the purposes of demonstrating conformity of Long Range Transportation Plans, the emissions cap for the gridded area provided by UDOT for the attainment demonstration modeling is 138.5 Metric Tons/Day.

g. Basic Vehicle Inspection and Maintenance

As a result of the Clean Air Act Amendments of 1990, EPA promulgated Title 40 of the Code of Federal Regulations (CFR), Part 51, which established minimum requirements for basic and Enhanced I/M programs. The state was required to demonstrate that all of the I/M programs in operation in the state meet the federal basic program requirements. As a result of that promulgation, the state revised this SIP to include Section X, Basic Automotive Inspection and Maintenance (I/M). The Utah County I/M program was revised to comply with the basic I/M program requirements specified in 40 CFR Part 51, Section X of this SIP, and applicable Utah Statutes. Those changes will remain intact until replaced by the Enhanced I/M program required in Section IX.C.6.j of this SIP.

h. Submittal of Tri-annual Emissions Inventory

The state completed a comprehensive emissions inventory for the 1990 base-year as required by the Act. That inventory is discussed in Section IX.C.6.c of this SIP. The state is further required by 187(a)(5) of the Act to submit a comprehensive emissions inventory meeting the same level of reliability every three years to demonstrate that progress is being made to attain the standard. The state will submit a comprehensive annual emissions inventory and winter week-day inventory which meets the same criteria as the 1990 base-year emissions inventory every three years, beginning with the 1993 inventory which will be submitted to EPA by September 30, 1995. As new and more accurate methods of estimating emissions are developed, the base-year emissions may be, with EPA concurrence, adjusted to allow for more accurate estimations of the impacts of various control strategies and emissions increases. However, these adjustments will not reflect actual increases in emissions.

i. Enhanced Vehicle Inspection and Maintenance as Required by 187(a)(6) of the Act

Section 187(a)(6) of the Act requires states to implement a program as defined in 182(c)(3) of the Act. Section 182(c)(3)(A) specifically states that]Enhanced I/M programs are only required for non-attainment areas located in urbanized areas with a 1980 census of 200,000 or more. Because the 1980 census for the Provo/Orem Urbanized Area was 169,699, such a program is not required under 187(a)(6) of the Act. However, the state has found that it is only through the implementation of such a program that the NAAQS can be attained, and a requirement for the implementation of Enhanced I/M is discussed under IX.C.6.j, Control Strategies, below.

j. Control Strategies

(1) Approved in SIP prior to 1990 (Savings Clause)

The following control strategies were contained in the SIP prior to its amendment in 1994 by the Air Quality Board. Because the reductions gained from the implementation of these controls was significant, they are retained in this SIP. Calculations for reduction derivations are contained in the Technical Support Document.

(a) Federal Motor Vehicle Control Program

As discussed in IX.C.4, replacing older vehicles in the fleet with newer models produces a reduction in carbon monoxide emissions. Using the MOBILE5a model, the composite emission factor g/vmt for vehicles in the fleet traveling at 30.2 mph at 47.5º F decreases by 29.8% between 1990 and 1996, and for speeds of 63 mph, the reduction is 40.8%. While the total emission reductions vary with the speed, temperature, type of I/M program, oxygenate content of the fuel, etc, this demonstrates that a significant reduction is realized as the fleet turns over into newer vehicles. If these variables are factored out, the implementation of the federal program will result in a 52.46 tpd reduction of CO emissions between 1990 and 1996.

(b) Automobile Inspection/Maintenance and Anti-Tampering

The discussion contained in this section was originally developed in early 1983 using data available at that time. This I/M program has been changed significantly since that time, and the calculations concerning the amount of reduction and control credit have changed substantially. As is discussed later in this SIP, this basic I/M program will be replaced by an Enhanced I/M program capable of reducing carbon monoxide emissions equivalent to the model Enhanced I/M program as specified in 40 CFR Part 51.351 (as published in the Federal Register on November 5, 1992 (Model Program)).

In order to meet the requirements of the Federal Clean Air Act and to provide for the attainment of the NAAQS, the Utah County Board of Health adopted regulations instituting an I/M and anti-tampering program in Utah County. By using I/M inspection and failure rate data from the Salt Lake County I/M program and vehicle registration data from the Utah State Tax Commission, the Utah County I/M program was originally designed to have a stringency factor of 30%. The anti-tampering program inspects all carbon monoxide control equipment. These combined programs were calculated to reduce automobile carbon monoxide emissions by 23%.

Utah County officials worked in cooperation with state and federal agencies to implement a public awareness program in Utah County. This program included such activities as radio and television public information spots, displays at the County Health Fair, handing out brochures, free voluntary inspections prior to program start-up, and discussions with local news reporters.

The opinion of the Utah County Attorney regarding the county's authority to implement I/M is found in Section X, Appendix 8; the County Commission Resolution giving the Board of Health authority necessary for adopting I/M, and the Board of Health I/M regulations are contained in Section X, Appendix 8. The basic I/M program was implemented according to the schedule included in a SIP revision submitted to EPA in 1983.

(c) Transportation Control Measures

The application of Transportation Control Measures (TCMs) in the Provo area was originally considered in February of 1982 by the Mountainlands Association of Governments (MAG) in their document "Transportation Control Plan for the State Implementation Plan".

Further traffic flow improvements were outlined by the Utah Department of Transportation and adopted by the MAG's Physical Planning Committee in July, 1985. The 1982 document is incorporated by reference into this plan and a brief summary of the conclusions contained in it is provided in Section XI, Appendix 1.

The following TCMs which were adopted by the MAG (See the Technical Support Document) are appropriate for reduction of carbon monoxide emissions in Provo:

1) The transportation brokerage outlined in IX.C.4 continues to operate in Utah County. Its program includes the construction and operation of park and ride lots, the coordination of car and van pooling programs, and coordination of transportation needs.

2) Five major traffic improvements have been partially implemented in Provo. Traffic speed on five major roads were increased to reduce carbon monoxide emissions. Those roads and the increases in average vehicle speed along each agreed to by the Utah Department of Transportation and Provo City included:

a) University Avenue - from 23 to 28 mph.
b) 1230 North - from 10 to 15 mph.
c) University Parkway - from 21 to 23 mph.
d) 200 West between 300 South and the University Parkway - from 25 to 28 mph.
e) 300 South between 700 East and 500 West - from 27 to 32 mph.

Possible alternatives for attaining the required speed increases are detailed in the Technical Support Document. To fully implement these speed increases and document them by means of a "before-and-after" study, a signal re-timing study is required. To maintain these speeds with increasing traffic volumes and changes in movement, signal re-timing will be performed every three years, at a minimum. Commitments to fund and make these changes are contained in the Utah Valley Area Transportation Study's Transportation Improvement Program #23 contained in the Technical Support Document. Provo City and the Utah Department of Transportation are the government agencies having jurisdiction over the above mentioned roads and are the implementing agencies for this control measure. These improvements are calculated to reduce automobile carbon monoxide emissions by 3% (See the Technical Support Document). The VMTs included in the 1990 base-year emissions inventory included credit for the implementation of these control strategies.

(d) Transit Improvements

The Utah Transit Authority began a mass transit program in Utah County which was calculated to reduce the automobile carbon monoxide emissions by 1%. (See the Technical Support Document)

(2) Developed for 1994 Submittal

(a) Oxygenated Fuels Program

In compliance with section 211(m) of the Act, an oxygenated gasoline program was implemented on November 1, 1992, in Utah County. R307-8, Oxygenated Gasoline Program, was adopted by the Air Quality Board and submitted to EPA by the Governor.

The oxygenated gasoline program requires that gasoline sold in the Provo/Orem MSA meet an average minimum oxygen content of 2.7% oxygen by weight from November 1 through the end of February of each year.

The SIP modeling demonstration includes implementation of I/M program improvements capable of reducing carbon monoxide emissions equivalent to the model Enhanced I/M program as specified in 40 CFR Part 51.351 published in the Federal Register on November 5, 1992 (Model Program) by January 1, 1995. As stated previously, if Utah County does not implement the Enhanced I/M program by January 1, 1995, or does not implement other equivalent automotive improvement programs, the average oxygen content standard for oxygenated gasoline sold in Utah County after November 1, 1995, will be 3.1% oxygen by weight until the next full control period after all subject vehicles have been inspected by the Enhanced I/M program at least once, or other automotive improvement programs are implemented. The Enhanced I/M program must meet the Enhanced I/M performance standards of 40 CFR Part 51.351, and any programs must be at least equivalent to the mobile source emission factors in the matrix contained in Table IX.C.23 on page 66. R307-8 is being revised concurrently with the adoption of this revision of the SIP to implement the changes discussed in this paragraph if the Enhanced I/M program is not implemented by January 1, 1995.

Modeling predicts that the current oxygenated gasoline program, with an oxygen content of 2.7% by weight, will reduce ambient carbon monoxide by 3.4 parts per million (ppm) at the University Avenue monitor on the design day. As discussed on page 32, the implementation of a 3.1% oxygen by weight standard would reduce ambient carbon monoxide emissions from on-road vehicles by about 5%, or slightly more than one-year's growth in on-road emissions. The documentation for these calculations is contained in the Technical Support Document.

(b) Enhanced Vehicle Inspection and Maintenance Program

One of the most cost-effective control strategies for reducing emissions from motor vehicles is enhanced inspection and maintenance (Enhanced I/M). The emissions inventory demonstrates that the major source of carbon monoxide in Utah County is the motor vehicle fleet. As demonstrated in **Figure IX.C.15** on page 40, implementation of Enhanced I/M would cause significant CO emission reductions. Enhanced I/M would also reduce NO_x emissions from the on-road fleet to compensate for

NO_x increases due to the oxygenated gasoline program that was implemented to reduce automotive CO emissions. As is detailed in the Technical Support Document, the implementation of Enhanced I/M equivalent to the model program will result in approximately an 11% reduction of tailpipe NO_x emissions.

The implementation of Enhanced I/M required statutory changes and can only be implemented with the advice and consent of the local county government officials. The statutory changes were made during the 1994 legislative session. The state has worked with Utah County to develop the schedule to develop and implement an Enhanced I/M program no later than July 1, 1995, with possible automotive emission control supplements. The success of this plan is contingent upon the county adhering to the dates contained in Table IX.C.15.

Figure IX.C.14 visually demonstrates that an annual Enhanced I/M program could result in a total emissions reduction of 99.98 tons/day of CO from motor vehicles, which represents a 33% reduction of CO from the Utah County fleet by December 31, 1995. Although Enhanced I/M will also reduce hydrocarbon, NO_x, and toxics emissions, the state is only taking credit for CO reductions equivalent to the model program.

Figure IX.C.14
COMPARATIVE EFFECT OF I/M PROGRAMS
UTAH COUNTY

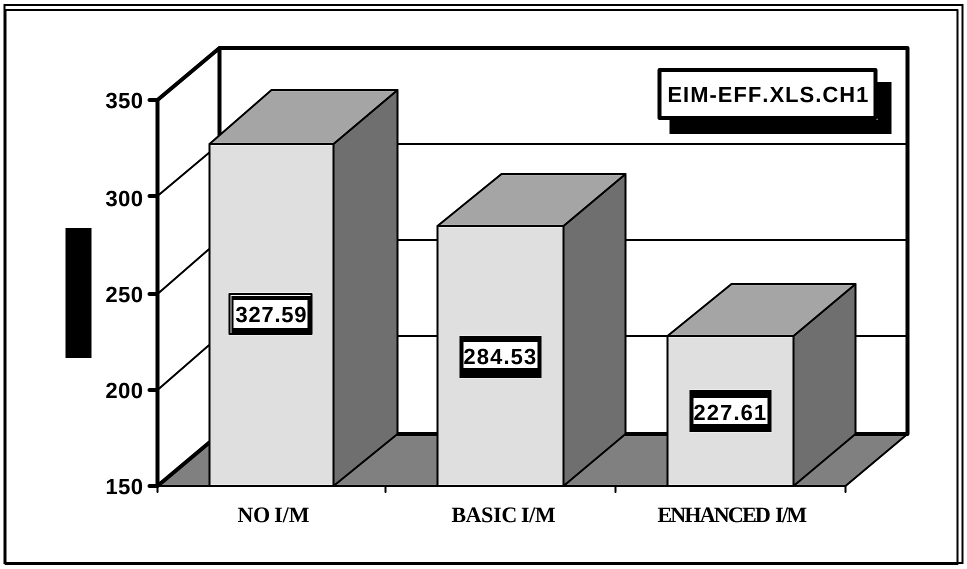


Table IX.C.15 represents the state's commitment to adopt and implement an Enhanced I/M and/or automotive emission control programs capable of achieving mobile source emission factors, using MOBILE5a, equivalent to those contained in Table IX.C.23 on page 66 no later than July 1, 1995. If the July schedule is followed, this plan contains contingency measures which will be triggered to replace the emission reductions to levels necessary to attain the NAAQS. As was stated previously, this is not the preferred option of the state, since it complicates the implementation of this plan, and results in the use of gasoline containing 3.1% oxygen by weight for at least one winter season. As can be seen from the table, the county must act quickly to implement Enhanced I/M and/or automotive emission control programs as soon as possible, or attainment of the NAAQS by the date specified in the Act will not occur, resulting in significant socio-economic impacts to the state.

Utah County will commit by July 31, 1994, to a combination of automotive emission controls that will achieve the mobile source emission factors, using MOBILE5a and other techniques ,equivalent to those contained in Table IX.C.23 on page 66. The combination of controls and documentation of the potential emission reductions will be supported by technical documentation necessary for an approvable SIP. Utah County with help and assistance from the Division of Air Quality and the Environmental Protection Agency will study alternatives to Enhanced I/M and oxygenated fuels.

Table IX.C.15
ENHANCED I/M IMPLEMENTATION SCHEDULE
UTAH COUNTY

MILESTONE	DATE (7/1/95 STARTUP)
Enhanced I/M Task Force formed to facilitate program development	Feb 94
Legislature and governor authorize Enhanced I/M	Mar 94
Utah County submits to Executive Secretary a commitment to implemen, per this schedule, a combination of automotive emission controls capable of reducing emissions sufficiently to meet the fleet emission factor specifications contained in Table IX.C.23 on page 66	July 31, '94
County Enhanced I/M or equivalent automotive emission control program rulemaking complete	Jan 95
State rulemaking for Enhanced I/M or equivalent automotive emission control program complete	Feb 95
Request for Proposal (RFP) and/or specifications released, as applicable	Feb 95
Submit Enhanced I/M or equivalent automotive emission control program SIP to EPA	Feb 95
Bids submitted to counties, as applicable	Mar 95
Contracts awarded, as applicable	Apr 95
Updated analyzers received for certification, if applicable	May 95
Buildings, equipment, software, etc., complete	Jun 95
Certification complete, Enhanced I/M program begins operation	Jul 95

(c) Mandatory No-Burn Days (Woodstoves, Heaters, and Fireplaces)

The state performed an analysis of meteorological and monitoring data from past exceedances of the CO NAAQS to determine a basis on which to call no-burn days to control CO emissions from wood stoves. A discussion of that study is contained in the Technical Support Document. Based on the conclusions of that study, the following criteria will be followed to initiate a no-burn period to control CO emissions from woodburning beginning with the winter of 1994/1995.

If the running eight-hour average CO concentrations as monitored by the state reaches 5.0 or more a "YELLOW" (voluntary) condition for wood and coal burning will be called.

A "RED" (mandatory) no-burn condition will be called if during the woodburning period from November 1 through March 1 the running eight-hour average CO concentrations as monitored by the state at 4:00 PM reaches a value of 6.0 ppm or more.

A "RED" (mandatory) no-burn condition may be called when meterological conditions warrant. These conditions are as follows:

1) forecasted clearing index value of 250 or less;
2) forecasted wind speeds of 3 mph or less;
3) passage of a vigorous cold front through the Wasatch Front; or
4) arrival of a strong high pressure system into the area.

In addition to the conditions contained in (1) through (4) above, more reliance on forecasted meteorological conditions will be used which will require greater flexibility in initiating the no-burn period.

The no-burn requirement based on CO concentrations will be restricted to the actual area of non-attainment (i.e., Provo and Orem Cities). This is because CO is a very localized pollutant, and homes outside the non-attainment area probably will not have a significant impact on emissions at the hot spots. It will also be much easier to enforce a rule which is restricted to a smaller and much more populated area.

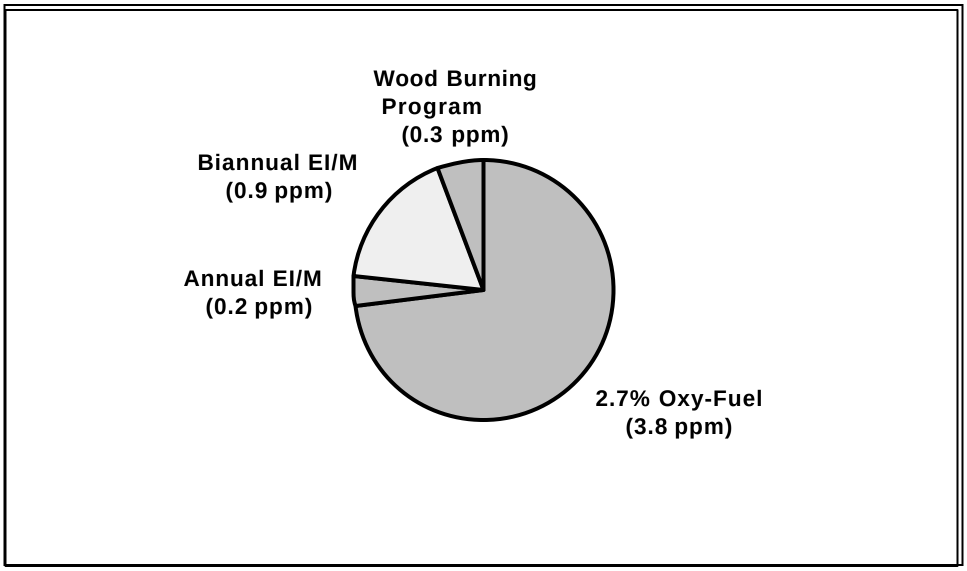
It is expected that this program would create as many as 25 to 30 "RED" periods during the winter season in Provo and Orem. Also, it is expected that as the state gains experience with implementation of the above listed criteria and further scientific study, further refinements to the process will be recommended for implementation. Also, because there is a possibility that having a no-burn period to control CO emissions may present new problems which the staff responsible for enforcing the rules have not encountered previously, the state may subsequently, through the SIP process, change this SIP and the implementing rules to reflect the experience gained during the first enforcement season.

The rules of the Air Quality Board have been changed to reflect the above program.

(d) Summary of Emissions Reductions

Figure IX.C.15 demonstrates the amount of control each of the above strategies will achieve on the control day at the control intersection as discussed in Section IX.C.6.k on page 55. This figure graphically demonstrates that, of the additional 5.1 ppm reduction required after application of all controls which were in place in 1990, or which the federal government will implement, the oxy-fuels program will result in the majority of the reduction (3.8 ppm), implementation of automotive emissions controls equivalent to an annual Enhanced I/M program will result in a 1.1 ppm reduction (0.9 from a biannual program and an additional 0.2 ppm by having an annual program), and the wood burning control program will result in a 0.3 ppm reduction. These reductions are discussed further in Section IX.C.6.k.

Figure IX.C.15
CO CONCENTRATION REDUCTIONS BY EACH CONTROL STRATEGY
UTAH COUNTY



(e)   Point Source Controls

No new point source controls are proposed through this SIP. The SIP will, however, incorporate by reference any existing permits, any restrictions on plant operating schedules, and any restrictions on plant throughput rates, upon which the projection year inventory for CO was based, along with appropriate enforceability provisions. The projections for Pacific States are based on an operational shift from 4:00 am through 2:30 pm as discussed on page 57 and a projection-year throughput of 539.09 tons/day. A new approval order will be issued to Pacific States by January, 1995, which makes this operational schedule enforceable and limits throughput of metal charged at the cupola to 539.09 tons/day. (See the Technical Support Document: "Response to EPA's Review of Modeling Inventory, March 11, 1994.", 28 March, 1994). Any proposed change to either this schedule or the throughput will be reviewed for impact on the attainment status of the surrounding area, and the approval order and/or this SIP will be revised. Any modification of the plant which may result in increased CO emissions or which may change the characteristics of any CO emission plumes will be reviewed in light of this SIP for the impact which such change may have on ambient CO concentrations in the area to insure that ambient CO concentrations do not increase beyond those projected in this CO SIP. The permit will include appropriate monitoring and recordkeeping requirements for demonstrating compliance with the conditions contained in the permit. The permit issued will be incorporated by reference into and enforceable through this SIP.

The emissions from Geneva are based on the implementation of various controls for which Geneva has been issued permits as required in Section IX.A (PM_{10}) of this SIP. On October 19, 1993, Geneva Steel received an Approval Order from the UDAQ for Sinter Plant Baghouses. The modifications to the sinter plant include removal of two wet scrubbers presently located on the #1 and #2 wind boxes and replacement of each with one baghouse. A Flue Gas Desulfurization system will also be installed to improve sulfur removal efficiency. The exhaust gases will be discharged from the existing fans to the atmosphere through a common 13-foot diameter 125-foot tall stack, which is located directly south of the sinter building. The temperature of the cleaned exhaust gas at the stack will be approximately 250 °F. Combining the exhaust gas discharge into one stack and eliminating the current wet scrubber system will result in higher discharge temperature and buoyancy from the stack, which reduces the impact of pollutants on the surrounding environment. See Section IX.C.6.k(5) for modeling conclusions.

Due to the complexity of the Geneva Steel mill, and the numerous operating assumptions and work practices on which the CO emission projections depend, all permits issued since the PM10 SIP was promulgated by the state until the date of adoption of this SIP, as well as any PM10 SIP provisions not superseded by those permits, are incorporated by reference into this SIP, and will be enforceable through this SIP. Any modification of the plant which may result in increased CO emissions or which may change the characteristics of any CO emission plumes will be reviewed in light of this SIP for the impact which such change may have on ambient CO concentrations in the area to insure that ambient CO concentrations do not increase beyond those projected in this CO SIP.

(f) Other Controls - No Reduction Credit Claimed

The state and county are implementing several programs and studying the effects and implementation of several programs to determine the resulting decreases in carbon monoxide emissions in the non-attainment area. This SIP claims no emission reduction credits for implementation of these programs at this time; however, as enforceable programs are developed and the amount of reduction is documented, this plan will be revised to include these programs.

1) Remote Sensing

There has been and continues to be considerable discussion throughout the United States relative to the accuracy or feasibility of the implementation of a remote sensing program as an acceptable or effective control strategy. Provo City was involved in a remote sensing study carried out by the University of Colorado in the Provo area. EPA has reviewed several such studies, but to date, has not found any evidence that a remote sensing program is an acceptable alternative control for mobile source emissions. Utah County officials are committed to the development and implementation of such a program, and the state is committed to assisting with providing available resources, staff, and/or facilities necessary for this research. The state will also assist the county in the procurement of funding for this study, and particularly with the development of a center capable of completing the federal test procedure, which is essential to the documentation of reductions from any program implemented. If, as a result of these studies and test programs, the state has ample data to demonstrate that remote sensing is a viable alternative on-road mobile source CO control strategy, this SIP will be modified to reflect the implementation of such a program.

2) Transportation Control Measures

During the development of this SIP, considerable effort was expended, including a study conducted by a private contractor hired by the county, to study the effect of various transportation control measures, including employee commute options (ECOs), strictly enforcing the 55 mph speed limit on the freeway, moving traffic patterns around in the non-attainment area, a vehicle scrappage program, fleet conversion to clean fueled vehicles, and traffic signal synchronization and coordination. None was found by the contractor to have significant impact on carbon monoxide emissions or concentrations in the non-attainment area. Several only resulted in moving the problem from one area to another. After considerable discussion, none of these programs were implemented. In the 1994 session of the Utah State Legislature, a bill was passed which allows the development of a mandatory ECO program. Utah County will continue to study the effectiveness of these transportation control measures, and implement them as they determine necessary. The state will work with county officials to implement programs like the ECO program as it is implemented in other counties, and will help the county document the emissions reductions achieved from these programs. As the documentation is developed, this SIP will be changed to reflect implementation of the programs.

k. Attainment Demonstration

This attainment demonstration is organized to include a brief introduction discussing the technical approach. It then discusses the development of the emissions inventories required to support the modeled attainment demonstration, some of which reflect the control strategies discussed in Section IX.C.6.j. above. The modeling analysis is then discussed in two major parts: the UAM/CAL3QHC modeling to examine winter-time stagnation episodes, and several special studies required to specifically examine the impacts from major elevated point sources. Finally, a summary of the modeling analysis used for the attainment demonstration is presented. The final section, IX.C.6.k(6), contains modeling summary tables.

(1) Introduction

(a) Background

The 1990 Clean Air Act Amendments require that carbon monoxide (CO) non-attainment areas with design values greater than 12.7 ppm include as part of their State Implementation Plan (SIP) revision a demonstration of attainment of the CO National Ambient Air Quality Standards (NAAQS). The Provo City area in Utah County, Utah has a design value of 15.8 ppm and was required to submit an attainment demonstration by November 1992 showing how attainment will be achieved by December 31, 1995.

In lay terms, the the state demonstrates attainment of the standard by showing that the national health-based standard is not being violated anywhere in the non-attainment area at any time. Ideally, the way to do that would be to install monitoring sites everywhere in the county, which would be impossible. Therefore, as an alternative, several complex computer models have been developed which simulate meteorological conditions and emitters of the pollutant in question (in this case, carbon monoxide), and calculate where pollution goes and what concentrations would be seen at various "receptors", or imaginary monitoring sites, throughout the modeled area. This becomes complicated as air containing a pollutant moves away from where the pollutant is released into the air, and the concentration of the pollutant goes down. For example, the farther one gets from the street, the lower the concentration of carbon monoxide from cars on the street becomes due to dilution. This is all affected by wind speed and direction.

The first steps involved in using the computer model are to gather as much meteorological data and emissions inventory data as possible from a day when the health standard was violated. This data is put into the computer, and the model develops a complex series of equations to describe how the pollution moves around on days when the standard is likely to be violated. In Utah County, these violations occur when there is very little wind.

The modeler adjusts or calibrates the model to predict what the same pollution concentration as was measured at the receptors on the day when the violation was observed. To verify the accuracy of the predicted concentrations at the receptors, the person using the model verifies that the predicted concentration near an actual monitoring site is the same as was actually read on the monitoring equipment. For example, in the Provo area, there are two main monitors: the University Avenue monitor and the North Provo Monitor. The University Monitor is right on University Avenue, and historically records the highest monitored carbon monoxide values in the county. The other monitor site, North Provo, is in a more secluded area, by the national guard armory, and routinely monitors lower values than at University Avenue. When the model is calibrated, it must show that its predicted concentration at all monitoring sites is reasonably close to the concentration which the monitor actually measured. This means that monitors away from where the pollution is actually occurring (e.g., not on the most heavily travelled street) will still agree with the model even though they may read lower concentrations of carbon monoxide. It also means that if, for example, the University Avenue monitor were to be located at another site, such as on 300 East, where it might monitor lower concentrations, it would still agree with the computer model. It will show that the highest concentrations of carbon monoxide are close to the source of the emissions.

The closer the agreement between the modeled and monitored values, and the more actual monitoring sites that are available, the better one is able to rely on the output of the model. Because the state demonstrated good agreement between the model and several monitors operating in Utah County, the results of the modeling are expected to be very reliable. Furthermore, close agreement indicates that the model is able to mimic the meteorological conditions that cause a violation of the standard.

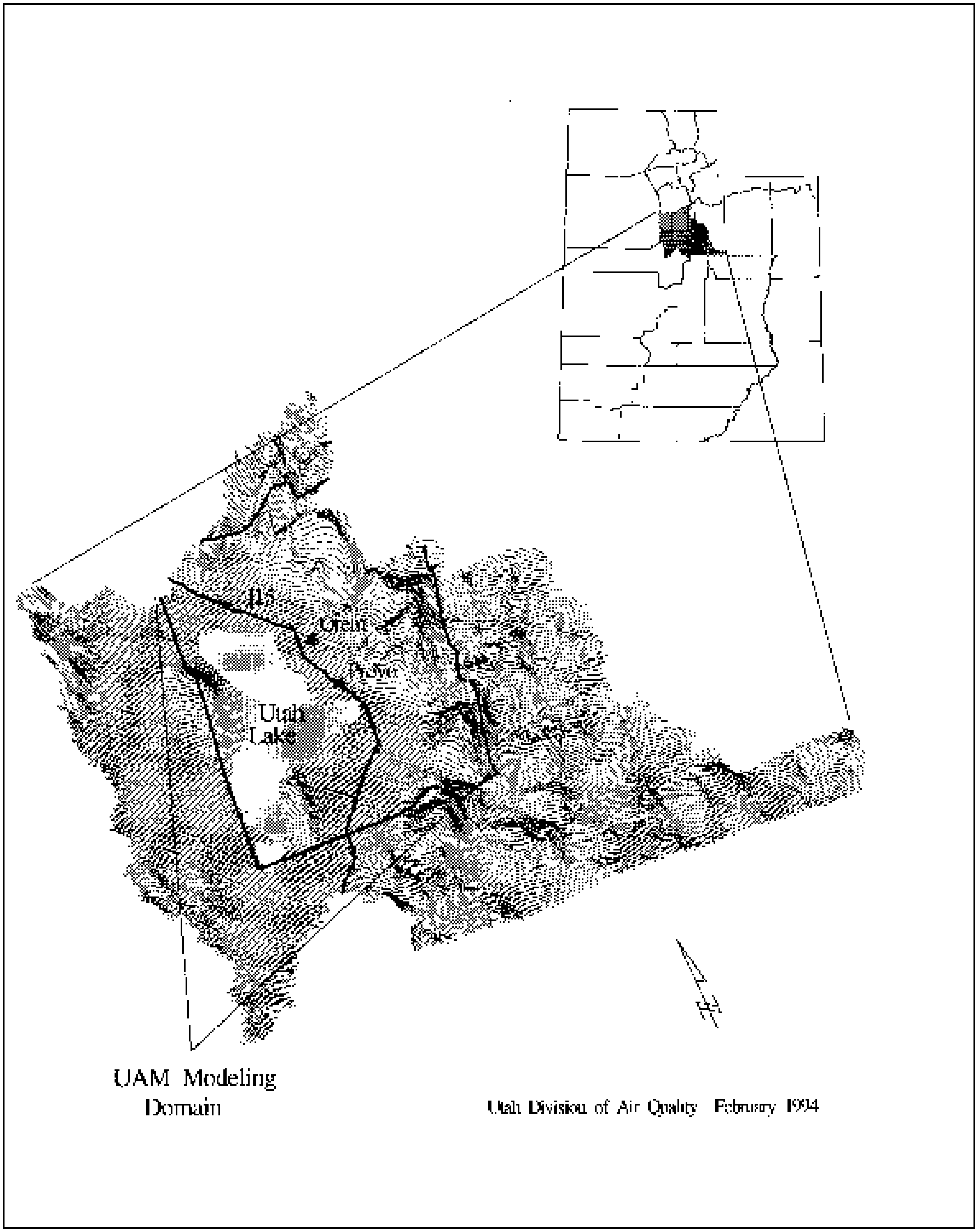
After the model is calibrated, the modeler is able to change the amount of pollution (emissions inventory) to reflect what pollutant levels are projected to occur in some future year. Basically, the model will show what will happen if that amount of pollution is emitted into the air under the same meteorological conditions that caused the violation of the standard. If, in that future year, the model shows that the standard will be exceeded, it is the responsibility of the state to develop "control strategies" which can be implemented to reduce those predicted emissions such that the standard will not be violated. The development and verification through modeling of these control strategies is referred to as the attainment demonstration. The goal of this SIP is to implement control strategies which will allow attainment of the national health-based standard by 1996.

Located in Utah County, Provo is nestled between Utah Lake to the west and the Wasatch Mountains to the east along the Provo Bench. This is depicted graphically in **Figure IX.C.16**. The bench ranges from approximately 10 km wide at the northern end near American Fork to 3 km wide at the south end just south of Provo. To the south of Provo the east bench is approximately 15 km wide extending south to Payson. Carbon monoxide emitted (primarily from motor vehicles) into this area during conditions of poor meteorological dispersion is trapped and accumulates over time, resulting in high ambient CO concentrations. These conditions occur during winter stagnation episodes under strong temperature inversions and often persist for several days. The surrounding complex terrain--mountains, valleys, canyons, and Utah Lake--induces a complex wind flow pattern.

In addition, there are two significant CO point sources in the vicinity of Provo--Geneva Steel (Geneva) located approximately 12 kilometers to the northwest of Provo, and Pacific States Cast Iron Pipe (Pacific States) located approximately 5 kilometers south of Provo.

For the Provo non-attainment area and surrounding region, complex emission source contributions and complex meteorology combine to hinder the accuracy and reliability of simple Gaussian dispersion models. The Urban Airshed Model (UAM), a grid model developed by Systems Applications International (SAI), which can handle complex emission contributions, complex terrain and complex meteorological conditions, was selected for the CO SIP modeling attainment demonstration.

Figure IX.C.16
URBAN AIRSHED BASIN CHARACTERISTICS
UTAH COUNTY



(b) Modeling Protocol

In September 1992, the Utah Division of Air Quality (UDAQ) prepared a final UAM modeling protocol which is contained in the Technical Support Document. (See the Technical Support Document: "UAM Modeling Protocol for Carbon Monoxide SIP Attainment Demonstration for Utah County", 8th September 1992.) The protocol was reviewed and approved by EPA and interested public before the modeling was conducted. The protocol addressed approaches and methodologies to be followed in conducting the UAM modeling, including specification of the modeling domain, episode selection, and input preparation procedures. In the protocol, three primary episode days were selected for the UAM modeling. These three days were selected based on historically high monitored CO exceedances and the availability of the meteorological data necessary to conduct the UAM modeling. A further discussion of the selection process is contained in the modeling protocol. The dates are 01/10/90, 12/17/91, and 01/24/92. The modeling domain is a 40x50 grid consisting of 1km x 1km grid cells.

The modeling analysis involved application of UAM, a grid model, and CAL3QHC, a roadway intersection model. UAM gives regional background concentrations for each grid cell, while CAL3QHC estimates micro-scale "hot spot" concentrations near major roadway intersections to be added to concentrations from UAM.

(c) Special Studies

The EPA typically recommends that the Diagnostic Windfield Model (DWM) be used for the development of UAM windfields. However, because of Utah County's complex terrain and the close proximity of a large water body, SAI, EPA, and the state determined that the DWM would not be adequate to characterize the upper level winds needed to model the emissions from elevated point sources, and for those sources an alternative analysis would be used. In addition, the UAM analysis was only being applied to winter-time stagnation episodes when the state had monitored exceedances. The EPA questioned whether elevated point sources in and of themselves could contribute to or cause a violation of the CO standard during non-stagnant periods. To address these problems several special studies were undertaken.

A tracer study was conducted in 1991/92 winter to assess possible impacts from the Geneva and Pacific States elevated major point sources. The tracer study covered two of the three primary episode days, 12/17/91 and 01/24/92. Therefore, impacts from the major point sources for these two episode days could be estimated using the tracer study.

For the 01/10/90 episode, no tracer study data was available, and difficulties and uncertainties were encountered in quantitatively assessing the impacts for the major elevated point sources. Qualitatively, it was felt that the impacts for this day should be lower than those for the two episode days covered by the tracer study, because of a stronger and more persistent inversion preventing elevated plumes from mixing downward and reaching the ground, plus a persistent southeasterly wind carrying Geneva plumes towards the lake and away from Provo. To achieve a quantitative evaluation of the impacts for the 01/10/90 episode with higher confidence, EPA retained their consultant, SAI, to develop prognostic wind fields for simulating physical processes expected to occur during the episode.

The UAM modeling only covered wintertime episodes. Impacts from Geneva's plant-wide emission sources for periods other than wintertime episodes also needed to be investigated. Under UDAQ's supervision, Geneva's consultant, Chester Environmental, estimated the impacts through modeling using ISCST2 and COMPLEX1. The impacts from Geneva emission sources were combined with concentrations caused by mobile emissions near roadway intersections (estimated by DAQ using the CAL3QHC model) and monitored regional background concentrations to give total concentrations.

The results of the tracer studies indicated that emissions from Pacific States Cast Iron Pipe Company, like those from Geneva Steel, had no impact on downtown Provo during stagnant conditions. To further substantiate this, the SCREEN2 model was run for Pacific States. The results of this modeling analysis support the tracer studies findings. (See the Technical Support Document: SCREEN2 Modeling Analysis, Pacific States.)

(d) Objectives

The main modeling objectives were to:

1) identify contributors to the CO non-attainment problems during wintertime stagnation episodes;

2) evaluate impacts of the two major elevated point sources (Geneva and Pacific States) using ISCST2/COMPLEX1 and CAL3QHC for periods of non-stagnation;

3) identify the non-attainment boundary for wintertime stagnant periods and other non-wintertime seasons; and

4) demonstrate attainment for different control measures.

(2) Modeling Emission Inventories

Modeling emission inventories must be developed before any modeling can be conducted. For Utah County, the sources in the developed inventories can be classified into the following categories: mobile sources, stationary area and minor point sources, and major elevated point sources. Requirements for modeling emission inventories may be different for different models. In the following, development of the inventories for modeling major elevated point sources with ISCST2/COMPLEX1 is discussed in (a) and the development of the emission inventories for mobile sources, and stationary area and minor point sources utilized in the UAM modeling is addressed in (b) and (c).

(a) Base-Year/Attainment-Year Emissions Inventories Without Controls For ISCST2/COMPLEX1

The emission inventories for each of the two point sources, Geneva Steel and Pacific States, both for the 1990 and 1996 simulations, have been reviewed by EPA. Following is a discussion of the procedures used in calculating the emission rates for the major emissions points (taken from "Response to EPA comments concerning Geneva Steel Portion of the 1990 Base-Year and 1996 Projection-Year Emission Inventories for Provo Carbon Monoxide SIP," December 6, 1993 (DAQT-173-93); Technical Support Document, Part I, and "Basis for Geneva's Sinter Plant and Blast Furnace Bells CO Emissions", December 16 1993 (DAQT-181-93); Technical Support Document, Part I.)
As stated in Section IX.C.6.c(1), page 19, for the base-year inventory, the Sinter Plant was the source of 92.6% of the CO emitted at the entire Geneva Steel facility in 1990. The Blast Furnace produced 4.3% and the remaining six five sources (Coke Plant, Power House, Rolling Mill, Open Hearth and Vehicle Traffic) produced the last 3.1% of CO emitted at Geneva Steel in 1990.

In 1991, the Q-BOP replaced the Open Hearth. As a result, the contributions from each source at Geneva for 1996 are slightly different. As a result, the Sinter Plant contributed 80%, the Q-BOP 16.3%, the Blast Furnace 2.3% and the remaining plants 1.4% to the total CO projected as the worst case scenario to occur at Geneva Steel in 1996. The emission rates used in the modeling are shown in Table IX.C.16.

Sinter Plant

The CO emissions at the Sinter Plant were arrived at in the following manner:

> The 1992 tracer study stack test data represented the most accurate data for CO emitted from the Sinter Plant in 1990. For the modeling base-year inventory, 971 g/sec was the highest average eight-hour rate at the North Stack, and 990 g/sec was the highest average eight-hour rate at the South Stack.
>
> The 1992 tracer study stack test data was also the basis for the projection year numbers. The maximum one-hour average CO concentration was 13,800 ppm (1.38%). The maximum flow-rate of 306,822 dscfm is based on the design capacity flow-rate, which can be found in the Sinter Plant baghouse notice of intent (NOI) dated November 1992. These numbers were the basis for the 1996 seasonal inventory and the 1996 modeling inventory.

Blast Furnace

> Each blast furnace is equipped with an upper bell and a lower bell. A skip goes up and dumps into the upper bell; and with each skip, the upper bell dumps into the lower bell. The lower bell dumps into the furnace after every three skips. The lower bell dumps twice per charge. Therefore, there are six skips per charge.
>
> The CO calculation for the Blast Furnace bells is based on the number of charges that did occur in 1990 or could occur in 1996 at both blast furnaces. The calculation accounts for all skips/charges at both blast furnaces. The projection-year emissions are based on the maximum number of charges that could occur at both blast furnaces. The system could not handle more than those proposed for 1996.

Q-BOP

> The highest one-hour emissions rate is based on the fact that Geneva is not prohibited by their UDAQ permit from operating two Q-BOP's simultaneously. Thus, Geneva used a factor of 8784 heats/yr for each collection system at the Q-BOP. In order to compensate for the possibility of running both Q-BOPs at the same time, Geneva projected 2 heats/hr in their calculations, which resulted in the 8784 heats/yr per unit or 17568 heats/yr total for the system. In addition, Geneva used a 98.5% efficiency factor for the flare-on scenario.
>
> It is possible to have two oxygen blow steps, or parts of two oxygen blow steps, of the cycle within the same hour with only one operational Q-BOP. The other scenario in which two heats may occur in the same hour is when one Q-BOP is being shut down and the other Q-BOP is being brought on line. However, the oxygen plant and the waste-water treatment facilities at Geneva are not designed to handle the capacity of running two Q-BOPs simultaneously for long periods. As a result, it is an accurate assessment to propose that the highest one-hour emission rate would occur during a two-heat-per-hour scenario at the Q-BOP.

An attainment year emissions inventory with controls for which Geneva has not already received a permit from the state was not required. Geneva was found not to cause or contribute to a violation of the CO standard in the base-year after the application of the previously permitted controls. In addition, modeling of Geneva without controls for the attainment year indicated even less impact than for the base-year. These modeling results are discussed in detail in Sections IX.C.6.k(3), (4), and (5).

Nearly all (99.6%) of Pacific States' CO emissions come from the cupola. The cupola emission rate used in the modeling is 1089 g/s. Because the tracer study and modeling showed that Pacific States' normal operation did not significantly impact the areas of non-attainment, an attainment year emissions inventory with controls was not required. These modeling results are discussed in Sections IX.C.6.k(4) and (5).

Table IX.C.16

COMPARISON OF EMISSION FACTORS
BASE-YEAR TO PROJECTION- YEAR
GENEVA STEEL

CO SOURCE	1990 g/sec	1996 g/sec
South Sinter Stack	990	2327.96
North Sinter Stack	971	
QBOP Flare off		366.55
QBOP Flare on		81.3
QBOP Steam Boiler #1		1.33
QBOP Steam Boiler #2		1.33
Blast Furnace #1	20.61	19.53
Blast Furnace #2	0	19.53
Blast Furnace #3	20.61	19.53
B.F. Stove 1 & 2 (combined)	1.4	2.49
B.F. Stove 3	1.4	1.25
B.F. Flame Supp.1	0.08	0.05
B.F. Flame Supp.2	0	0.05
B.F. Flame Supp.3	0.08	0.05
Hot Oil System		0.66
Catalytic Incinerator		0.11
Coke Comb. Stack #1	0.51	2.47
Coke Comb. Stack #2	0.54	2.9
Coke Comb. Stack #3	0.56	2.96
Coke Comb. Stack #4	0.51	3.05
Coke Oven Charging etc. Nos. 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, & 21 (each oven)	0.45	0.47
Power House Comb. #2 & #3 (combined)	2.1	2.07
Power House Comb. Nos. 4, 5, & 6 (each stack)	2.1	2.07
Power House Coal Comb. 1, 2, & 3 (combined)	1.9	2.7
Soaking Pits Stacks Nos. 1, 3, 5, 7, & 9 (each stack)	0.13	0.4
Reheat Stack #2	1.4	4.66
Reheat Stack #3	1.4	4.66
Vehicle Traffic Nos.1, 2, 3, 4, & 5 (each)	10.23	10.23*
Open Hearth Stack Nos. 1, 2, 3, 4, 5, 6, 7, & 8 (each stack)	0.419	

*This is a conservative estimate for the projection-year modeling, compared to the 8.8 g/s contained in the inventory. See the Technical Support Document.

(b) Base-Year/Attainment-Year Emissions Inventories Without Controls For UAM/CAL3QHC

UAM modeling requires episode-specific gridded hourly inventories. CO emissions for each 1-km X 1-km grid cell must be specified for each hour of a day.

In September, 1992, UDAQ developed an episode-specific hourly gridded mobile CO inventory for Utah County for both the base-year and the attainment year, based on VMT data supplied by the Utah Department of Transportation (UDOT) and mobile emission factors from MOBILE4.1 (See the Technical Support Document: "Development of Episode-specific Hourly Gridded Mobile CO Emissions for Utah County Using the Non-DTIM Method", 16th September 1992).

On October 9, 1992, UDOT submitted to DAQ an updated VMT data set, which contained gridded average workday VMT for 1990 and 1996 from the MINUTP transportation model. Accordingly, a gridded mobile CO inventory was developed based on the updated VMT data. (See the Technical Support Document: "Updated Episode-specific Hourly Gridded Mobile CO Emissions for Utah County Using Non-DTIM Method", 4th November 1992).

An hourly gridded CO emission inventory was also developed for stationary area and minor point sources. (See the Technical Support Document: "Summary of Hourly Gridded CO emissions from Area and Minor Point Sources in Utah County for 1990 Winter Workday", 4th November 1992).

The above developed gridded CO modeling emission inventories were submitted to EPA, who had their consultant, Systems Application Inc. (SAI) review the inventories. SAI, concurring with the comments and suggestions made by Dale Wells and Kevin Golden of EPA, provided their specific comments on the submitted modeling inventories. Incorporating SAI's comments and new mobile emission factors from the newly released MOBILE5.0 (the most recent version, MOBILE5a, gives the same emission factors), an updated modeling inventory for the base-year and attainment year (basic I/M without oxygenated fuel program) was developed. (See the Technical Support Document: "Episode-specific Utah County CO Modeling Emission Inventory Updated as of April 28, 1993", 4th May 1993).

This inventory was used to model the selected episodes for the base-year and attainment year without controls (basic I/M without an oxygenated fuel program).

(c) Attainment year (1996) Modeling Emission Inventories With Controls

Different control strategies were modeled to assess if the strategies are sufficient to show attainment everywhere in the UAM modeling domain. For each control measure, a new modeling emission inventory needed to be developed for each modeled episode.

To model the benefits of the combination of basic I/M and oxygenated fuel programs, a modeling inventory was developed. (See the Technical Support Document: "1996 Mobile CO Emission Inventory for Utah County UAM Modeling, Updated for Oxygenated Fuel and Basic I/M Programs", 1st October 1993). The basic I/M and oxygenated fuel programs were shown to achieve attainment in 1996 for the 12/17/91 and 01/24/92 episodes. Further control measures were needed for the 01/10/90 episode.

To model the effects of Enhanced I/M (biannual) and oxygenated fuel programs, another modeling inventory was developed accordingly. (See the Technical Support Document: "1996 Mobile CO Emission Inventory for Utah County UAM Modeling, Updated for Enhanced I/M and Oxygenated Fuel Programs", 7th October 1993).

To model the benefits of a woodburning control program, the modeling inventory was updated. (See the Technical Support Document: "1996 CO Emission Inventory for Utah County UAM Modeling, Updated for Stationary Area Sources", 26th October 1993). UAM modeling showed that the Enhanced I/M (biannual), oxygenated fuel and woodburning control programs are close but not enough to achieve attainment for the 01/10/90 episode.

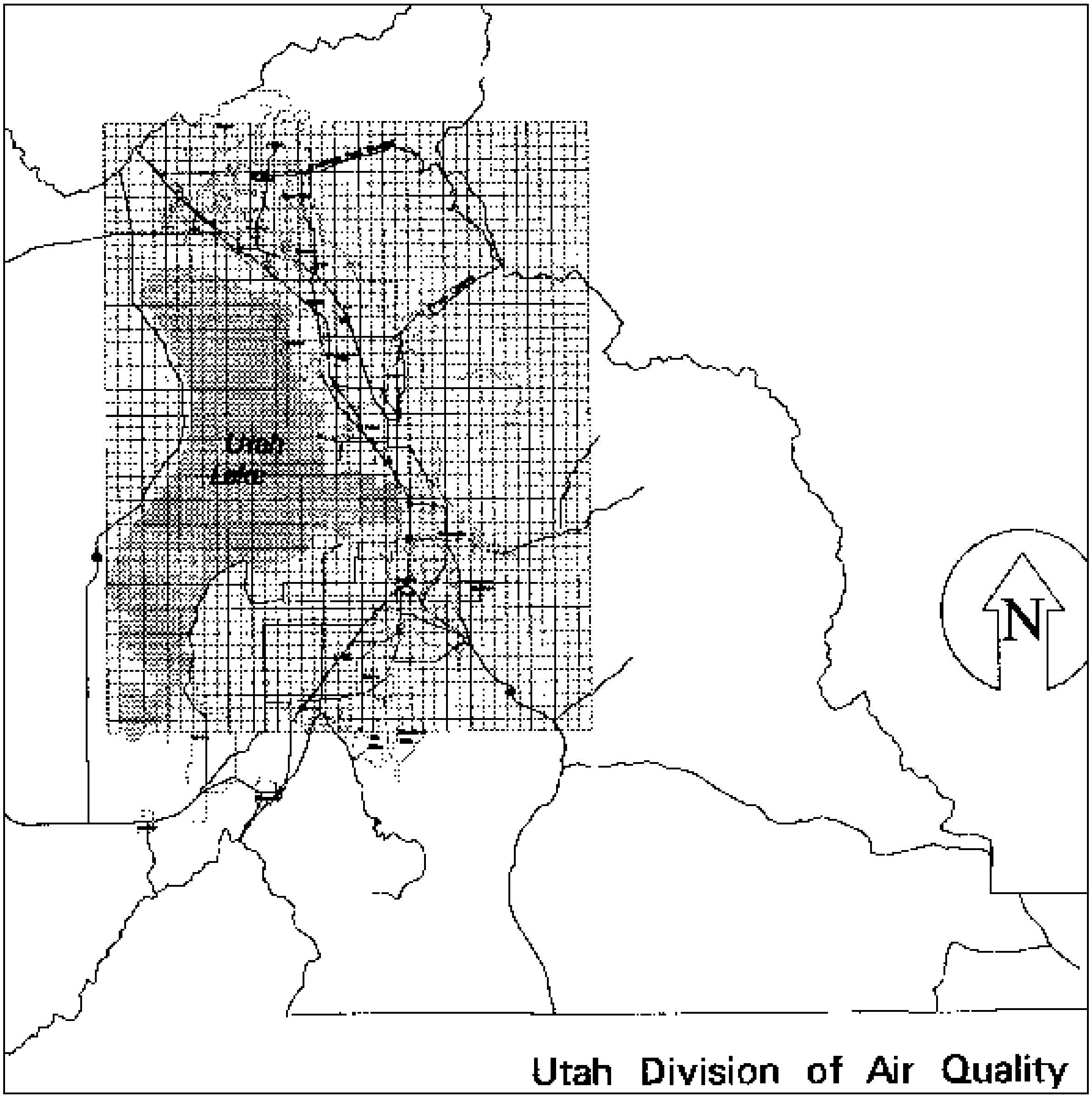
To investigate further scenarios to reduce emissions, a modeling inventory for annual Enhanced I/M, oxygenated fuel and woodburning programs was developed. (See the Technical Support Document: "1996 Mobile CO Emission Factors for Utah County UAM/CAL3QHC Modeling, Updated for Enhanced I/M (Annual) and Oxygenated Fuel Programs", 18th January 1994). Modeling indicated that this inventory can show attainment in 1996 for the remaining 01/10/90 episode.

(d) Comparison Between The Base-Year County-Wide Inventory And The Base-Year Modeling Inventory

There are differences between the county-wide CO mobile emission inventory (county-wide inventory) and mobile emission inventory for modeling (modeling inventory). Although the two inventories are derived from the same traffic database from the Utah Department of Transportation (UDOT) using essentially the same MOBILE5 emission input files, they are expected to be different because the two inventories are developed for different purposes. The differences are addressed in the Technical Support Documents. (See the Technical Support Document: "Comparison Between County-wide CO Mobile Emission Inventory and Modeling Mobile Emission Inventory for Utah County", 26th January 1994).

One main difference is in the areas being covered by the inventories. The county-wide inventory covers the entire Utah County, while the modeling inventory encompasses the UAM modeling domain, which is a 40x50 km gridded area covering the significant CO emission regions of the county. **Figure IX.C.17** shows the UAM domain and the county boundary. The areas not covered by the UAM domain are unpopulated areas, which contribute only a minor portion of CO emission to the county total. In addition, the modeling has shown the CO emission impacts are very localized. The emissions from the areas not covered by the UAM domain will not impact the concerned Provo/Orem area. For instance, emissions from Interstate I-15 within the UAM domain contribute about 45% of the total mobile emissions for UAM episode days, but they have been shown to have no impacts on downtown Provo due to their relative distance from the maximum impact locations. The emissions from the areas not covered by the UAM are much smaller than the I-15 emissions and much farther away from Provo and, therefore, have no impacts on the Provo/Orem area.

Figure IX.C.17
UAM MODELING DOMAIN
UTAH COUNTY



Other differences between the county-wide inventory and the modeling inventory are in time periods, spatial resolution, temporal resolution, vehicle speeds and temperatures for calculating MOBILE5 emission factors:

-Time periods
County-wide inventory: Emissions for a typical winter workday.
Modeling inventory: Emissions for specific CO episode days.

-Spatial resolution

County-wide: Emission totals for the entire county.

Modeling: Emissions for each of 40x50 grid cells.

-Temporal resolution

County-wide: Daily emission totals.

Modeling: Emission variations with each hour of modeled episode days.

-Vehicle speeds

County-wide: Road types include interstate, principle arterial, minor arterial, collectors, and local streets. Each road type uses a single speed averaged over the entire county for that road type.

Modeling: The same road types are used, but vehicle speeds are link-specific (a link is a section of roadway). Each individual roadway link uses its own speed.

-Temperatures

County-wide: Emission factors are based on daily maximum and minimum temperatures for the ten highest CO days during the winters of 1988, 1989, and 1990. (TEMFLG=1)

Modeling: Emission factors are based on the actual hourly temperatures of the specific episode days. (TEMFLG=2)

-Vehicle miles traveled (VMT)

County-wide: Total daily VMT is obtained for each road type.

Modeling: Traffic volumes and VMT are link specific and vary with each hour of a day.

For the stationary area and minor sources, the comparisons are more straight forward. The area sources are categorized as aircraft, railroads, non-road vehicles, coal burning, oil and gas space heating, and wood burning. The emission totals are assigned to UAM grid cells for each hour of a day based on source-specific information or population.

To derive the attainment-year modeling inventory, the base-year modeling inventory was projected using the same factors as were used to project the county-wide inventory. The above comparisons between the modeling and county-wide inventories also apply for the attainment year.

A numeric comparison between the sum total carbon monoxide (CO) emissions from area and mobile sources within the gridded modeling domain (an area measuring 40 by 50 kilometers) and the inventory covering the entire politically-defined county boundary shows compatible results (see Table IX.C.17) considering the factors identified above. (See the Technical Support Document: "Comparisons Between Emissions Reported in County-Wide vs. Gridded Modeling Inventories", 18 March 1994)

Table IX.C.17
INVENTORY COMPARISON: GRIDDED AREA TO COUNTY-WIDE
UTAH COUNTY

CATEGORY	GRIDDED AREA MODELING INVENTORIES		COUNTYWIDE EMISSIONS INVENTORIES	
	1990, (tpd)	1996, (tpd)	1990, (tpd)	1996, (tpd)
On-Rd Mobile	322.30	138.5	353.23	189.72
Non-Rd Mobile	1.96	1.96	3.15	3.50
Forest Fires	0.00	0.00	0.00	7.71
Railroads	1.10	1.10	0.59	0.68
Aircraft	0.22	0.22	0.71	0.77
Oil & Gas Heat	0.66	0.66	0.65	0.76
Woodburning	20.90	9.24	22.35	9.92
Coalburning	3.96	4.84	3.80	4.22
SUM TOTAL	351.10	156.52	384.48	217.28

Explanations for differences between the countywide inventories and the modeling inventories for the individual source categories follow:

1) On-Road Mobile

The modeling inventories utilized a gridded VMT covering the area of non-attainment produced by the Utah DOT. Not covered in this gridded area are the rural communities of Payson, Salem, Palmyra, Benjamin, Elk Ridge, and Woodland, and significant segments of Interstate-15 and State Highway 89 which are major arteries to St. George, Las Vegas, and Southern California. The tons per day (TPD) difference between the countywide on-road inventory and modeling inventory for a given year can be attributed to this difference in emission area.

In 1996, the on-road mobile emissions drop sharply in both the modeling and countywide inventories due to the effects of an Enhanced I/M program implemented in 1995. Although the tonnages are lower, the rationale for 1990 remains true for 1996.

2) Non-Road Mobile

The non-road emissions for the modeling inventory and the county-wide inventory differ primarily because of their respective spatial coverage. As the emission numbers show, the growth from 1990 to 1996 is expected to be somewhat higher outside the modeling area.

3) Forest Fires

For 1990, both inventories declare zero CO emissions. No measurable forest fires occurred that year. For 1996, the modeling inventory reports zero emissions while the countywide inventory reports 7.71 tons per day. This difference is due to two factors. First, the forested area is primarily outside of the modeling domain. A review of Figure 1 shows the Uintah National and Manti-La Sal forests extending from the foothills east of metropolitan

Provo/Orem to the far easterly part of the county. These forests are primary candidates for fires. Secondly, the county-wide projected emissions of 7.71 TPD in 1996 is based on a ten-year history of forest fires projected onto the winter of 1996. The obvious random nature of forest fires makes it extremely difficult to anticipate the future likelihood of such an event. In the absence of a better prediction method, a method linked to the ten-year forest fire history was one approach that could be documented. During nine of the past ten years, fires consumed relatively few acres; however, one huge fire in the 1980's raised the ten-year average up to the stated 7.71 TPD level. All of this tonnage was distributed to the higher, less accessible areas of these two forests. This area is entirely outside of the modeling area.

4) Railroads, Aircraft, Oil and Gas Heat, Woodburning, and Coalburning

When the modeling and county-wide inventories of each of these sources are compared individually (see Table IX.C.17), there are differences resulting primarily from the spatial location of the source (e.g., railroads and aircraft). Sources allocated by population (e.g., space heating by wood, coal, and oil/gas) exhibit smaller differences because most of the county's population resides within the urbanized modeling domain.

The modeled woodburning emissions were derived based on an emission factor of 249.5 (lbs CO)/(ton wood) and a seasonal adjustment factor of 1.7. An EPA review of these factors, subsequent to the finalization of the modeling, indicated that a factor of 212.31 (lbs CO)/(ton wood) and a seasonal adjustment of 2.12 would be more appropriate. An analysis of the effect these new factors would have on the downtown Provo CO concentrations derived from UAM was undertaken. Because the changes in the two factors offset one another, the resulting adjustments to the woodburning emissions and thus, concentrations, are negligible (0.004 ppm). (See the Technical Support Document: "Adjustment of the UAM Modeled CO Concentrations Due to Change in the Methodology for Estimating Woodburning Emissions", 24 March 1994.)

(3) UAM/CAL3QHC Modeling

The UAM modeling simulates hourly concentration evolutions for each grid cell. The CAL3QHC model estimates micro-scale "hot spot" concentrations near roadway intersections on an hour-by-hour basis. The concentrations from CAL3QHC are combined with the regional background concentrations from UAM to compare with the observed concentrations at monitoring sites for the base-year. The comparisons determine if the modeling meets the modeling performance criteria prescribed in the UAM modeling protocol. (See the Technical Support Document: "UAM Modeling Protocol for Carbon Monoxide SIP Attainment Demonstration for Utah County", 8th September 1992.) If the modeling meets the performance criteria, the same meteorological conditions and modeling parameters used for the base-year (except for emission inputs) are applied to model the attainment year. In accordance with EPA policy, for the purposes of demonstrating attainment of the standard, a modeled violation is equivalent to a monitored violation, and subject to the same requirements.

(a) Base-Year Modeling

A summary of the UAM modeling conducted for the three primary episodes for the base-year is summarized in the Technical Support Documents. (See the Technical Support Document: "UAM Modeling Evaluation for Utah County CO Air Quality", 25th May 1993.) CAL3QHC modeling, corresponding to the same modeling conditions, was documented in the Technical Support Documents (See the Technical Support Document: "CAL3QHC Modeling for Estimating CO Concentrations near Major Roadway Intersections in Utah County", 6 May 1993).

The UAM/CAL3QHC modeling results were submitted to EPA and SAI for review and comments. Considering the spatial resolution limit for vehicle miles traveled (VMT) data from UDOT and the errors or uncertainties in assigning emissions to 1km x 1km grid cells, it was agreed between EPA and UDAQ that a four-cell average method should be used to give average regional background concentrations for CO monitoring sites or modeled roadway intersections. The model performance analyses for the base-year met the criteria set in the UAM modeling protocol. The methodology and results of the performance analyses are presented in the technical support document and referenced in Section IX.C.6.k(5).

The base-year modeling analyses discussed above were conducted for the three primary modeling episode days (1/10/90, 12/17/91, and 1/24/92). The UAM simulations for these days covered a time period from 0600 to 2400 on a 24-hour clock, while the CAL3QHC modeling covered only the period from 1300 to 2400 when the maximum roadway intersection concentrations were expected to occur. Summing the concentrations from these two models caused peak eight-hour average concentrations to occur in the evening hours of the episode days.

Modeling for the morning of the following day was conducted to ensure the concentrations for the episode taper off as expected (See the Technical Support Document: "UAM and CAL3QHC Base-year Modeling Evaluations for Utah County Carbon Monoxide (CO) Air Quality for Extension Periods of Primary Modeling Episode Days", 18th January 1994). This morning after modeling was completed for each primary episode day and showed that the hourly mobile emissions as well as the monitored CO values drop nearly to zero. Because the running eight-hour average concentrations are based on the previous eight hours, the eight-hour average concentrations for the early hours of the following morning may initially be somewhat high, but decline as the morning progresses. Thus, controlling the concentration peak on the primary episode day also ensures attainment during the following morning extension period.

(b) UAM/CAL3QHC Attainment Year Modeling

The same meteorological conditions and modeling parameters used for the base-year modeling were applied to the modeling for the attainment year 1996, except for the emission input files. The base-year emission inventory was projected both with and without control strategies in place. Different control strategies were modeled for the attainment year to examine the benefits of the strategies.

Attainment year modeling for evaluating effects of different control scenarios started with basic I/M without the oxygenated fuel program. (See the Technical Support Document: "Attainment Year 1996 UAM and CAL3QHC Modeling for Utah County CO SIP, for Basic I/M Program (without Oxygenated Fuel Program)", 26 January 1994). Modeling for basic I/M and oxygenated fuel programs was conducted next. (See the Technical Support Document: "Attainment Year 1996 UAM and CAL3QHC Modeling for Utah County CO SIP, Updated for Basic I/M and Oxygenated Fuel Programs", 26 January 1994). The basic I/M and oxygenated fuel programs were able to show attainment in 1996 for the 12/17/91 and 01/24/92 episodes. For the 01/10/90 episode, further emission reductions were needed.

Due to its high traffic volumes and fast vehicle speeds leading to high emission factors, the I-15 interstate contributes about 45% of total mobile emisions within the UAM domain. Modeling was also performed to examine if the large emissions from I-15 cause impacts on downtown Provo. (See Technical Support Document: "Summary of Attainment Year 1996 UAM Modeling for Estimating Impacts on Provo from Utah County Freeway I-15 CO Emissions", 26 January 1994). The modeling indicates the impacts on downtown Provo area from I-15 emissions are negligible.

The additional benefits from a woodburning program for the 01/10/90 episode were modeled. (See the Technical Support Document: "Attainment Year 1996 UAM and CAL3QHC Modeling for Utah County CO SIP, Updated for Enhanced I/M (Biannual), Oxygenated Fuel and Woodburning Control Programs", 26 January 1994). The combination of biannual Enhanced I/M, oxygenated fuel and woodburning control programs still did not show attainment for the 01/10/90 episode. Another similar scenario including annual Enhanced I/M, oxygenated fuel and woodburning programs was modeled. (See the Technical Support Document: "Attainment Year 1996 UAM and CAL3QHC Modeling for Utah County CO SIP, Updated for Enhanced I/M (Annual), Oxygenated Fuel and Woodburning Control Programs", 26 January 1994). This scenario did show attainment for the 01/10/90 episode. This is one scenario that may show attainment, using the emission factor table presented in the Technical Support Document. (See the Technical Support Document: "1996 Mobile CO Emission Factors for Utah County UAM/CAL3QHC Modeling, Updated for Enhanced I/M (Annual) and Oxygenated Fuel Programs", 18 January 1994). Other scenarios (e.g. a bi-annual Enhanced I/M program with different MOBILE5a parameters) may also show attainment as long as the emission factors are equal to or lower than those given in Table IX.C.23 on page 66. Several scenarios were studied which did not show significant reductions in CO emissions, and are discussed in Section IX.C.6.j.

(4) Special Studies For Impacts From Major Elevated Point Sources

The above UAM modeling, utilizing the DWM, did not address the impacts from major elevated point sources in Utah County. The impacts were assessed by several special studies, which included a tracer study, a special UAM study using prognostic wind fields, and an ISCST2/COMPLEX1 dispersion modeling analysis for one full year (all seasons).

(a) Tracer Study

Two of the three UAM episode days, 12/17/91 and 01/24/92 were covered by the 1991/92 winter tracer study. The impacts from Geneva and Pacific States' elevated plumes were quantitatively evaluated using the tracer study data. (See the Technical Support Document: "Evaluations of Geneva and Pacific States Wintertime CO Impacts Using 1991-1992 Tracer Study", 10 September 1993). The results indicated that the impacts were insignificant for the two episodes.

(b) Special Wind Field and UAM Study

No tracer study was available for the 01/10/90 episode. EPA retained SAI to conduct a prognostic wind field/UAM study to assess the Geneva impacts for the episode. The summary report for the study was presented in the Technical Support Document. (See the Technical Support Document: "Technical Support In Modeling Stationary Source Impacts for The Provo, Utah Carbon Monoxide SIP", SAI, 17 November 1993). The study showed that the impacts were also insignificant for this episode.

(c) ISCST2/COMPLEX1 and CAL3QHC Modeling

The UAM modeling and tracer study only involved wintertime CO episodes. To investigate if Geneva emissions cause problems during other seasons, ISCST2/COMPLEX1 and CAL3QHC modeling studies were conducted. ISCST2 and COMPLEX1 examined impacts from Geneva plumes hour-by-hour for one full year. This ISCST2 and COMPLEX1 modeling served two purposes: 1) to investigate the possibility of Geneva Steel's impacts exceeding the CO NAAQS during unstable periods, and 2) to determine if Geneva should be included in the non-attainment area. The days with second highest concentrations from ISCST2/COMPLEX1 were modeled by CAL3QHC for roadway intersections of concern. These intersections were identified in conjunction with EPA Region VIII. The days with second highest concentrations were used because the CO standard is based on the highest second high (HSH) value at a monitoring site in the non-attainment area, and the purpose of dispersion model receptors is to represent monitoring sites. The total ambient concentrations were estimated by combining Geneva's concentrations from ISCST2/COMPLEX1 with "hot spot" intersection concentrations from CAL3QHC and regional background concentrations from CO monitors.

The ISCST2/COMPLEX1 modeling was conducted by Geneva's consultant, Chester Environmental, under supervision from UDAQ. The overall approach was to match Geneva's impacts with impacts from the intersection hot-spots along with monitored regional background concentrations in time and space. For example, the maximum concentration at an intersection from ISCST2/COMPLEX1 was combined with the same eight-hour maximum concentration for that intersection from CAL3QHC and the same eight-hour maximum regional background concentration from whichever reading was highest amongst available regional scale CO monitors. Once it was determined that the maximum point-source related impacts occur near the Geneva fence line, additional modeling was performed in order to more precisely identify the magnitude of the non-overlapping eight-hour running average. This modeling is described in the Technical Support Document. (See the Technical Support Document: "Utah County SIP Point Source Modeling, Running eight-hour CO Concentrations," 16 March 1994, and "CAL3QHC Modeling for Evaluating Geneva's eight-hour Running Average CO Impacts," 16 March 1994.) The detailed modeling methodologies (e.g. receptor placement and preparation of emission inputs, etc.) and results were documented in the Technical Support Document. (See the Technical Support Document: "ISCST2/COMPLEX1 Modeling for Estimating Impacts from Geneva Plant-wide CO Emissions", 1 February 1994). The modeling methodologies, justification for selection of roadway intersections and results for CAL3QHC modeling were documented in the Technical Support Document. (See the Technical Support Document: "Summary of CAL3QHC Modeling for Evaluations of Geneva CO Impacts", 25 January 1994). A final concentration summary table can be found in the 25 January 1994 document, or in Table IX.C.27 on page 69.

Air dispersion modeling was performed for the Pacific States Cast Iron Pipe (Pacific States) facility located approximately 4 km south of downtown Provo. ISCST2 was used to determine Pacific States' impacts in simple terrain (below stack height). The facilities' emissions were calculated to be 1089 g/s during the operational shift from 4:00 am through 2:30 pm. Therefore, appropriate emission scalars were used in the emission inventory section of ISCST2 to reflect the actual operating hours. The location of the maximum concentration was modeled with outputs of hourly concentrations, which were then used to calculate eight-hour running averages. The highest second high (HSH) concentration in the vicinity of the plant was 7244 $\mu g/m^3$ (6.3 ppm). Using the same procedure as for determining the maximum HSH concentration in the vicinity of the facility, a HSH in downtown Provo (exact location being the Courthouse) was determined to be 468 $\mu g/m^3$ (0.4 ppm). To determine whether or not complex terrain (terrain above stack height) would be a factor, COMPLEX1 was used. The HSH, eight-hour average calculated by COMPLEX1 was 8044

$\mu g/m^3$ (7 ppm). (See the Technical Support Document: "Response to EPA's Review of Modeling Inventory, 11 March 1994.")

(5) Summary of the Modeled Attainment Demonstration Results

The UAM and CAL3QHC models were used to simulate the three selected episodes for the base-year. The modeling was shown to meet the performance criteria prescribed in the UAM modeling protocol. The predicted CO concentrations are summarized in **Figure IX.C.18** on page 60. The same meteorological conditions and modeling parameters as used for the base-year were applied to the attainment year to examine different control strategy packages.

For the attainment year, the following control packages were modeled: 1) basic I/M without an oxygenated fuel program; 2) basic I/M and oxygenated fuel programs; 3) basic I/M, oxygenated fuel and woodburning control programs; 4) biannual Enhanced I/M, oxygenated fuel and woodburning control programs; 5) impacts from Interstate I-15 emissions; and 6) annual Enhanced I/M, oxygenated fuel and woodburning control programs. Scenario 2 demonstrated attainment for two of three episodes, while the last scenario (Scenario 6) demonstrated attainment for all three episodes. A summary table showing emissions used in the modeling for the last scenario is presented in Table IX.C.25 on page 67. This scenario shows attainment, using the emission factor table presented in the Technical Support Document. (See the Technical Support Document: "1996 Mobile CO Emission Factors for Utah County UAM/CAL3QHC Modeling, Updated for Enhanced I/M (Annual) and Oxygenated Fuel Programs", 18 January 1994). The table is also given on Table IX.C.23 on page 66. Other scenarios (e.g. a biannual Enhanced I/M program with different MOBILE5a parameters) may also show attainment as long as the emission factors are equal to or lower than those given in the table.

For comparison, the emission factor table for 1990 is presented in Table IX.C.22 on page 65. The MOBILE5 input parameters for generating the 1990 and 1996 emission factor tables can be found in Table IX.C.20 (page 63) and Table IX.C.21 (page 64). These tables are input records used by the model to establish the types of control programs in effect, the mix of vehicles in the fleet, and various other parameters required by the model. The interpretation of this data must be done in conjunction with the MOBILE5a Technical Reference and User's Manual. The episode-specific daily mobile emission totals of the UAM domain are summarized in Table IX.C.24 on page 66, while the emission totals for mobile, area and minor point sources are contained in Table IX.C.25 on page 67.

The 1991/92 Tracer Study was used to evaluate impacts from Geneva and Pacific States major elevated point sources for the two episodes, 12/17/91 and 01/24/92. It was shown that the impacts were insignificant. A summary of the tracer study results is given on Table IX.C.26 on page 68.

For the remaining episode, 01/10/90, a special prognostic wind field/UAM modeling study was conducted. The maximum eight-hour impact over the modeling domain was estimated as 0.4 ppm with 0.1 ppm in downtown Provo.

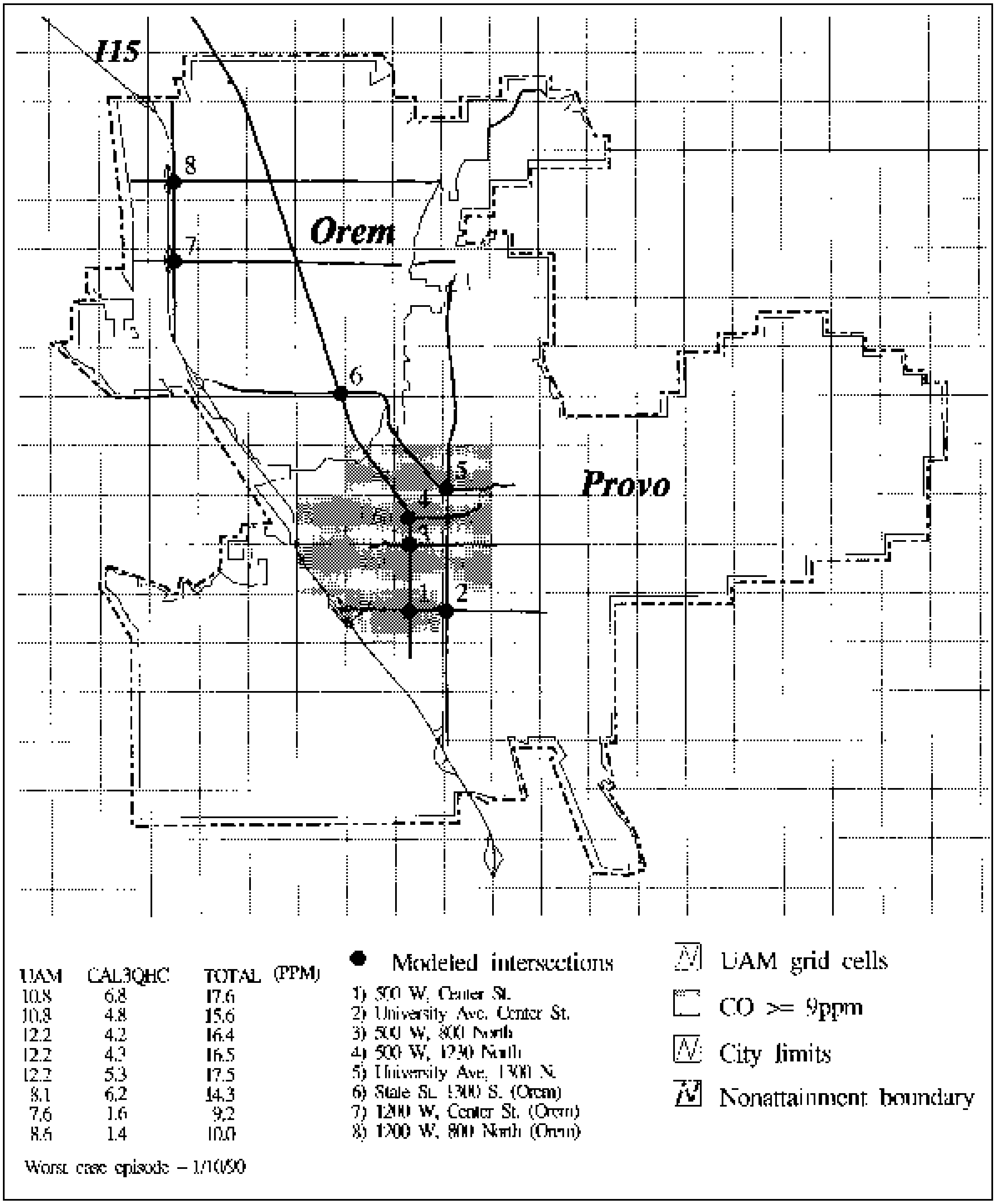
The impacts from Geneva's plant-wide emissions were assessed on an hour-by-hour basis for all four seasons using the ISCST2/COMPLEX1 and CAL3QHC models. The primary objective of this analysis was to examine impacts during non-stagnation periods. However, no violation was shown by the modeling for either non-stagnation or stagnation periods in the base-year. The results are summarized by Table IX.C.27 on page 69. The airshed shows improved air quality with the 1996 attainment year modeling inventory. The most dramatic improvements occurred close to the facility due to a rearrangement of CO discharges within the plant for the 1996 inventory year and the avoidance of building downwash by the largest CO emission source (new sinter plant discharge stack) in the model's inventory.

Air dispersion modeling for Pacific States Cast Iron Pipe Company showed that there were no violations of the eight-hour CO standard. Also, the highest second high eight-hour average in downtown Provo was calculated to be less than 0.4 ppm, and therefore did not significantly contribute to the exceedances in downtown Provo. (See the Technical Support Document: "Response to EPA's Review of Modeling Inventory, 11 March 1994.", 28 March 1994).

For the base-year, downtown Provo and three intersections within Orem were shown using the UAM/CAL3QHC analysis to exceed the eight-hour CO standard. **Figure IX.C.18** illustrates the highest UAM grid cells and CAL3QHC hot-spot intersections that were examined in the Provo/Orem area. The shaded area indicates the UAM grid cells that were greater than 9 ppm and would exceed the eight-hour standard without considering micro-scale hot-spots. The eight intersection hot-spots examined are marked in the figure with dots. The intersection CO contributions, modeled with CAL3QHC, are added to the appropriate UAM grid cell concentration to determine the total CO impact. The table in the lower portion of the figure gives the UAM contribution, the CAL3QHC intersection contribution, and the total CO impact at each intersection location. The modeling suggests that the non-attainment boundary should at least include these areas that have been shown to exceed the CO standard.

For the attainment year, using a control package consisting of a model Enhanced I/M program, oxygenated fuel and woodburning control programs, attainment for all selected episodes was shown using the UAM/CAL3QHC analysis. This analysis is discussed in the Technical Support Document. (See the Technical Support Document: "1996 Mobile CO Emission Factors for Utah County UAM/CAL3QHC Modeling, Updated for Enhanced I/M (Annual) and Oxygenated Fuel Programs", 18 January 1994).

Figure IX.C.18
CO NON-ATTAINMENT AREA BOUNDARY
PROVO/OREM



UAM	CAL3QHC	TOTAL (PPM)
10.8	6.8	17.6
10.8	4.8	15.6
12.2	4.2	16.4
12.2	4.3	16.5
12.2	5.3	17.5
8.1	6.2	14.3
7.6	1.6	9.2
8.6	1.4	10.0

(6) Modeling Summary Tables

Table IX.C.18
UAM and CAL3QHC MODELING RESULTS
BASE-YEAR
UTAH COUNTY

500 West & 1230 North, Provo (WN)
State Street & 1300 South, Orem (S3)
University Avenue & 1300 North, Provo (UN)
500 West & Center Street, Provo (WC)
500 west & 800 North, Provo (W8)
University Avenue & Center Street, Provo (U2)
1200 West & Center Street, Orem (OC)
1200 West & 800 North, Orem (ON)
I-15 impacts on OC or ON (I-15)

	1/10/90 Episode			12/17/91 Episode			1/24/92 Episode		
Site	**UAM**	**CAL3**	**TOT**	**UA M**	**CAL3**	**TOT**	**UAM**	**CAL3**	**TOT**
WN (10m) (50m)	12.2	2.6 4.3	14.8 16.5	7.4	4.2 4.0	11.6 11.4	7.1	5.1 3.8	12.2 10.9
S3	8.1	6.2 4.5	14.3 12.6	5.3	6.2 5.7	11.5 11.0	4.4	7.5 3.4	11.9 7.8
UN	12.2	5.3 4.7	17.5 16.9	7.4	4.8 5.0	12.2 12.4	7.1	4.0 3.1	11.1 10.2
WC	10.8	6.8 4.7	17.6 15.5	8.7	5.8 5.8	14.5 14.5	6.8	4.7 4.2	11.5 11.0
W8	12.2	4.2 3.9	16.4 16.1	7.4	3.7 4.2	11.1 11.6	7.1	2.7 2.7	9.8 9.8
U2	10.8	4.8 3.8	15.6 14.6	8.7	4.3 3.9	13.0 12.6	6.8	3.0 3.4	9.8 10.2
OC I-15	7.6	0.9 0.8 0.7	9.2						
ON I-15	8.6	0.7 0.6 0.7	10.0						

Table IX.C.19

UAM and CAL3QHC MODELING RESULTS
1996 WITH CONTROLS
UTAH COUNTY

(1996 WITH ANNUAL ENHANCED I/M + OXY-FUELS. + WOODBURNING CONTROL)

500 West & 1230 North, Provo (WN)
State Street & 1300 South, Orem (S3)
University Avenue & 1300 North, Provo (UN)
500 West & Center Street, Provo (WC)
500 west & 800 North, Provo (W8)
University Avenue & Center Street, Provo (U2)
University Parkway & 2230 North, Provo (UP)
Center St. and State St., Orem (CE)
800 North and State St., Orem (N8)

MAXIMUM 8-HOUR VALUES (PPM)

	1/10/90 Episode			**12/17/91 Episode**			**1/24/92 Episode**		
Site	UAM	CAL3	TOT	UAM	CAL3	TOT	UAM	CAL3	TOT
WN (10m)	6.0	1.4	7.4			< 9			< 9
(50m)		2.2	8.2			< 9			< 9
S3	3.9	3.0	6.9			< 9			< 9
		2.3	6.2			< 9			< 9
UN	6.0	2.9	8.9			< 9			< 9
		2.8	8.8			< 9			< 9
WC	5.4	3.3	8.7			< 9			< 9
		2.7	8.1			< 9			< 9
W8	6.0	2.2	8.2			< 9			< 9
		2.1	8.1			< 9			< 9
U2	5.4	2.6	8.0			< 9			< 9
		2.2	7.6			< 9			< 9
UP	3.7	1.2	4.9			< 9			< 9
		1.2	4.9			< 9			< 9
CE	3.5	2.0	5.5			< 9			< 9
		1.9	5.4			< 9			< 9
N8	3.9	1.8	5.7			< 9			< 9
		1.7	5.6			< 9			< 9

Table IX.C.20
BASE-YEAR (1990) MOBILE5 PARAMETERS
UTAH COUNTY

```
1       PROMPT
MOBILE5.0       1990, UTAH COUNTY, FOR UAM MODELING
1       TAMFLG
1       SPDFLG
1       VMFLAG
3       MYMRFG
1       NEWFLG
2       IMFLAG  -  yes, I/M program is in place
1       ALHFLG
2       ATPFLG  -  yes anti-tampering program in place
5       RLFLAG
1       LOCFLG  -
2       TEMFLG  -  calculate exhaust temperatures
4       OUTFMT
4       PRTFLG
2       IDLFLG  -  yes, idling emissions calculated
3       NMHFLG  -  VOC
1       HCFLAG  -  do not print HC components
 .013 .060 .089 .090 .079 .058 .067 .072 .063 .046        MYR.LDGV
 .031 .041 .036 .044 .036 .026 .019 .019 .019 .010
 .012 .006 .006 .009 .048
 .015 .064 .054 .065 .063 .072 .097 .081 .078 .050        MYR.LDT1
 .060 .032 .041 .037 .028 .020 .009 .015 .018 .008
 .009 .001 .003 .006 .074
 .007 .042 .042 .060 .040 .024 .046 .049 .044 .028        MYR.LDT2
 .020 .027 .024 .072 .064 .066 .051 .030 .041 .037
 .046 .023 .028 .024 .067
 .001 .014 .036 .029 .036 .029 .014 .007 .022 .022        MYR.HDGV
 .007 .036 .058 .058 .036 .079 .050 .050 .036 .058
 .058 .014 .036 .043 .173
 .013 .060 .089 .090 .079 .058 .067 .072 .063 .046        MYR.LDDV
 .031 .041 .036 .044 .036 .026 .019 .019 .019 .010
 .012 .006 .006 .009 .048
 .015 .064 .054 .065 .063 .072 .097 .081 .078 .050        MYR.LDDT
 .060 .032 .041 .037 .028 .020 .009 .015 .018 .008
 .009 .001 .003 .006 .074
 .055 .055 .055 .001 .018 .036 .036 .055 .055 .055        MYR.HDDV
 .018 .164 .091 .055 .036 .001 .036 .036 .001 .036
 .001 .036 .036 .018 .018
 .001 .062 .046 .046 .062 .031 .062 .011 .062 .077        MYR.MC
 .092 .092 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
86 14 68 20 01 01 095 3 1 2222 11 1                       I/M program
86 77 20 2222 21 095. 22221111                            ATP
2 90 20.0 32.0 20.6 27.3 20.6 01                          1st scenario
Utah County UT   C  10.  60. 15.0 15.0 92 1 1 1                  Local Area Parameters
```

Table IX.C.21
PROJECTION-YEAR (1996) MOBILE5 PARAMETERS
UTAH COUNTY

```
1        PROMPT  -  no prompt, vertical format
MOBILE5.0          1996, UTAH COUNTY, FOR UAM MODELING, 7/13/93.
1        TAMFLG  -  M5 tampering rates
1        SPDFLG  -  one avg speed for all veh types
1        VMFLAG  -  use M5 VMT mix
3        MYMRFG  -  input local reg distrib only
1        NEWFLG  -  M5 BERs
3        IMFLAG  -  yes, I/M program is in place
1        ALHFLG  -  no extra load corrections; a/c, towing
2        ATPFLG  -  yes anti-tampering program in place
5        RLFLAG  -  no refueling factors calculated
1        LOCFLG  -  one LAP for each scenario
2        TEMFLG  -  ambient temperatures used for correction of EF
4        OUTFMT  -  80-column
4        PRTFLG  -  print 3 polluntants
2        IDLFLG  -  yes, idling emissions calculated
3        NMHFLG  -  VOC
1        HCFLAG  -  do not print HC components
 .013 .060 .089 .090 .079 .058 .067 .072 .063 .046        MYR.LDGV
 .031 .041 .036 .044 .036 .026 .019 .019 .019 .010
 .012 .006 .006 .009 .048
 .015 .064 .054 .065 .063 .072 .097 .081 .078 .050        MYR.LDT1
 .060 .032 .041 .037 .028 .020 .009 .015 .018 .008
 .009 .001 .003 .006 .074
 .007 .042 .042 .060 .040 .024 .046 .049 .044 .028        MYR.LDT2
 .020 .027 .024 .072 .064 .066 .051 .030 .041 .037
 .046 .023 .028 .024 .067
 .001 .014 .036 .029 .036 .029 .014 .007 .022 .022        MYR.HDGV
 .007 .036 .058 .058 .036 .079 .050 .050 .036 .058
 .058 .014 .036 .043 .173
 .013 .060 .089 .090 .079 .058 .067 .072 .063 .046        MYR.LDDV
 .031 .041 .036 .044 .036 .026 .019 .019 .019 .010
 .012 .006 .006 .009 .048
 .015 .064 .054 .065 .063 .072 .097 .081 .078 .050        MYR.LDDT
 .060 .032 .041 .037 .028 .020 .009 .015 .018 .008
 .009 .001 .003 .006 .074
 .055 .055 .055 .001 .018 .036 .036 .055 .055 .055        MYR.HDDV
 .018 .164 .091 .055 .036 .001 .036 .036 .001 .036
 .001 .036 .036 .018 .018
 .001 .062 .046 .046 .062 .031 .062 .011 .062 .077        MYR.MC
 .092 .092 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
86 20 68 20 03 03 096 1 1 2221 2111                       Enhanced IM idle/2500RPM
95 20 86 20 03 03 096 1 1 2221 4211 0.80 20.0 2.00        IM240 program
86 77 20 2221 11 096. 22212222                            ATP
2 96 20.0 32.0 20.6 27.3 20.6  1                          1st scenario
Utah County UT   C  10.  60. 15.0 15.0 92 2 1 1                   Local Area Parameters
.400 .600 .027 .030 1                                     Oxy-fuels
```

Table IX.C.22

MOBILE5.0 EMISSION FACTORS FOR 1990
BASIC I/M ONLY
UTAH COUNTY

T(F)	14.00	17.60	21.20	24.80	28.40	32.00	35.60	39.20	42.80	46.40	50.00
T(C)	-10.00	-8.00	-6.00	-4.00	-2.00	0.00	2.00	4.00	6.00	8.00	10.00
MPH	**EMISSION FACTORS (G/VMT)**										
5.00	282.94	270.72	259.17	248.24	237.88	228.06	218.74	209.88	201.45	195.16	191.74
10.00	153.46	147.01	140.91	135.12	129.64	124.44	119.50	114.80	110.33	106.97	105.12
15.00	109.21	104.64	100.32	96.22	92.34	88.65	85.15	81.81	78.64	76.25	74.91
20.00	87.32	83.66	80.20	76.92	73.82	70.87	68.06	65.40	62.86	60.94	59.85
25.00	74.48	71.36	68.41	65.62	62.97	60.45	58.06	55.78	53.62	51.99	51.07
30.00	65.08	62.37	59.79	57.36	55.04	52.85	50.76	48.78	46.89	45.47	44.69
35.00	58.18	55.76	53.47	51.30	49.24	47.28	45.42	43.65	41.96	40.70	40.02
40.00	53.55	51.34	49.24	47.25	45.36	43.57	41.86	40.23	38.68	37.53	36.92
45.00	50.95	48.85	46.87	44.98	43.20	41.50	39.88	38.35	36.88	35.79	35.21
50.00	50.19	48.14	46.20	44.35	42.60	40.94	39.35	37.85	36.41	35.35	34.77
55.00	50.64	48.58	46.63	44.78	43.03	41.36	39.77	38.26	36.82	35.75	35.17
60.00	97.66	93.54	89.65	85.97	82.48	79.18	76.05	73.07	70.24	68.12	66.95
65.00	145.23	139.04	133.20	127.68	122.45	117.51	112.82	108.38	104.16	100.99	99.21
70.00	145.23	139.04	133.20	127.68	122.45	117.51	112.82	108.38	104.16	100.99	99.21
75.00	145.23	139.04	133.20	127.68	122.45	117.51	112.82	108.38	104.16	100.99	99.21

Table IX.C.23
MOBILE5.0 EMISSION FACTORS FOR 1996 (ANNUAL E-I/M + OXY.)
UTAH COUNTY

T(F)	14.00	17.60	21.20	24.80	28.40	32.00	35.60	39.20	42.80	46.40	50.00
T(C)	-10.00	-8.00	-6.00	-4.00	-2.00	0.00	2.00	4.00	6.00	8.00	10.00
MPH	**EMISSION FACTORS (G/VMT)**										
5.00	120.89	115.92	111.16	106.61	102.26	98.10	94.10	90.27	86.58	84.23	83.72
10.00	68.46	65.70	63.06	60.53	58.11	55.79	53.55	51.41	49.35	48.04	47.76
15.00	49.94	47.92	45.99	44.13	42.36	40.65	39.01	37.43	35.92	34.95	34.75
20.00	40.46	38.81	37.22	35.71	34.25	32.86	31.52	30.23	28.98	28.20	28.03
25.00	33.48	32.11	30.80	29.55	28.34	27.19	26.08	25.02	24.00	23.35	23.21
30.00	28.66	27.49	26.37	25.30	24.27	23.29	22.35	21.44	20.51	20.01	19.90
35.00	25.21	24.19	23.20	22.26	21.37	20.50	19.68	18.88	18.12	17.64	17.54
40.00	22.80	21.88	20.99	20.15	19.34	18.57	17.83	17.11	16.43	15.99	15.91
45.00	21.23	20.37	19.56	18.78	18.04	17.32	16.64	15.98	15.35	14.95	14.87
50.00	20.65	19.82	19.04	18.29	17.57	16.89	16.23	15.60	14.99	14.60	14.52
55.00	20.90	20.08	19.29	18.54	17.81	17.12	16.46	15.83	15.22	14.83	14.74
60.00	36.51	35.00	33.57	32.21	30.91	29.67	28.49	27.36	26.27	25.57	25.38
65.00	52.42	50.24	48.16	46.19	44.31	42.52	40.81	39.17	37.61	36.59	36.29
70.00	52.42	50.24	48.16	46.19	44.31	42.52	40.81	39.17	37.61	36.59	36.29
75.00	52.42	50.24	48.16	46.19	44.31	42.52	40.81	39.17	37.61	36.59	36.29

Table IX.C.24
EPISODE-SPECIFIC MOBILE CO EMISSIONS FROM THE UAM DOMAIN
UTAH COUNTY

DAILY EMISSIONS (METRIC TONS)

	Base-Year			**1996**		
Episode day	01/10/90	12/17/91	01/24/92	01/10	12/17	01/24
Basic I/M	293	300	279			
Basic I/M + Oxy Fuel *				158	175	175
E-I/M (annual) + Oxy Fuel **				138.5		

* - Basic I/M and oxygenated fuel programs showing attainment for 12/17 and 01/24 episode days

** - Annual Enhanced I/M (EPA performance standard) and oxygenated fuel programs showing attainment of all three episodes, 01/10, 12/17, and 01/24

Table IX.C.25
CO EMISSIONS USED IN UAM MODELING FOR 01/10/90 EPISODE
UTAH COUNTY

DAILY EMISSIONS (METRIC TONS)

Source Type	1990	1996
Mobile	293	138.5
Sub total	293	138.5
Airplanes	0.2	0.2
Coal burning	3.6	4.4
Railroads	1.0	1.0
Oil and gas space heating	0.6	0.6
Non-road vehicles	1.8	1.8
Wood burning	19.0	8.4
Area src total	26.4	16.4
Minor point sources	2.0	2.0
Sub total	2.0	2.0
Total	321.4	156.9

Table IX.C.26
TRACER STUDY RESULTS
UTAH COUNTY

Test #1: December 16-17, 1991 (Geneva & Pacific States)
Test #2: January 23-24, 1992 (Geneva & Pacific States)
Test #3: January 25-26, 1992 (Geneva)

The conservative evaluations of Geneva and Pacific States' impacts on concerned areas during the tracer study periods are listed in the following tables below as maximum eight-hour CO concentrations in ppm:

GENEVA SOUTH STACK (ppm)			
AREA	TEST 1	TEST 2	TEST 3
PROVO	0.035	0.020	0.026
OREM	0.061	0.057	0.061
LINDON	0.156	0.039	0.131
DOMAIN	0.156	0.170	0.131

PACIFIC STATES		
AREA	TEST 1	TEST 2
PROVO	0.088	0.086
OREM	0.089	0.099
LINDON	0.027	0.079
DOMAIN	0.420	0.179

If Geneva operates 16 hours per day and emits 52,000 tons per year, or has an emission rate of 2,473 g/sec, then Geneva's maximum eight-hour CO impacts (in ppm) would be as follows:

AREA	TEST 1	TEST 2	TEST 3
PROVO	0.121	0.065	0.074
OREM	0.210	0.186	0.173
LINDON	0.538	0.127	0.372
DOMAIN	0.538	0.553	0.372

Table IX.C.27

ISCST2/COMPLEX1 AND CAL3QHC MODELING RESULTS
GENEVA STEEL

Intersections:
- 800 N & State Street, Orem (N8)
- 1200 West & 800 N (WN)
- 1200 West & Center Street (WC)
- Geneva Road & Center Street (GC)
- Geneva Road & 800 N (GN)

CO monitors:
- Lindon (LN)
- Dispensary (DS)

MAXIMUM 8-HOUR VALUES (PPM)

	1990					**1996**				
Site	Date/ Time	ISC2/C PX1	CAL3	Background	TOT	Date	ISC2/C PX1	CAL3	Background	TOT
N8 (10m) (50m)	01/07 0400	2.7	1.9 0.5	2.3 (DS) 2.8 (LN)	7.4*	02/09	2.3	2.2 1.5	1.9 (DS) 1.2 (LN)	6.4
WN (I-15)	05/23	2.7	0.7 0.5 1.0	0.6 (DS) 0.5 (LN)	5.0	12/13	1.2	1.0 0.8 0.9	Data missing	3.1+ bkg
WC (I-15)	06/13	2.6	0.7 0.3 0.6	0.7 (DS) 0.4 (LN)	4.6	05/01	1.2	0.4 0.2 0.3	0.9 (DS) 0.4 (LN)	2.8
GC	10/06	1.1	0.3 0.3	Data missing	1.4+b kg	12/12	0.9	0.0 0.0	Data missing	0.9+ bkg
GN	08/27 1800	4.9	0.8 0.2	0.5 (DS)	6.2*	10/11	0.6	0.8 0.2	Data missing	1.4+ bkg

*Calculated with eight-hour Running Averages

l. Technical Support Documents (Tables of Contents)

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  5.3.3 Structural Fires
  5.3.4 Prescribed Burning/Slash Burning/Agricultural Burning
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 6.2 Non-Road Mobile Class
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     - 5.1.4 Natural Gas
     - 5.1.5 Oil
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     - 5.3.4 Prescribed Burning/Slash Burning/Agricultural Burning
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       Incineration
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       Firefighting Training
       Structural Fires
       Prescribed Burning/Slash Burning/Agricultural Burning
       Open Burning/Detonation
       Aircraft/Rocket Engine Firing and Testing
       Charcoal Grilling

6. Mobile Sources
   6.1 On-Road Mobile Class
   6.2 Non-Road Mobile Class
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       Railroad Locomotives
       Miscellaneous Non-Road Equipment

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   - 2.3 Updated Episode-specific Hourly Gridded Mobile CO Emissions for Utah County Using Non-DTIM Method (November 4, 1992)
   - 2.4 Episode-specific Utah County CO Modeling Emission Inventory Updated as of April 28, 1993 (May 4, 1993)
   - 2.5 1996 Mobile CO Emission Inventory for Utah County UAM Modeling, Updated for Oxygenated Fuel and Basic I/M Programs (October 1, 1993)
   - 2.6 1996 Mobile CO Emission Inventory for Utah County UAM Modeling, Updated for Enhanced I/M and Oxygenated Fuel Programs (October 7, 1993)
   - 2.7 1996 CO Emission Inventory for Utah County UAM Modeling, Updated for Stationary Area Sources (October 26, 1993)
   - 2.8 1996 Mobile CO Emission Factors for Utah County UAM/CAL3QHC Modeling, Updated for Enhanced I/M (Annual) and Oxygenated Fuel Programs (January 18, 1994)
   - 2.9 Comparison Between County-wide CO Mobile Emission Inventory and Modeling Mobile Emission Inventory for Utah County (January 26, 1994)
   - 2.10 Adjustment of the UAM Modeled CO Concentrations Due to Change in the Methodology for Estimating Woodburning Emissions (March 24th, 1994)
   - 2.11 Comparisons Between Emissions Reported in County-Wide vs. Gridded Modeling Inventories (18th March, 1994)
   - 2.12 Response to EPA's Review of Modeling Inventory, March 11, 1994 (28th March, 1994).

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   - 3.3 CAL3QHC Modeling for Estimating CO Concentrations near Major Roadway Intersections in Utah County (May 6, 1993)
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3.8 Attainment Year 1996 UAM and CAL3QHC Modeling for Utah County CO SIP, Updated for Enhanced I/M (Biannual), Oxygenated Fuel and Woodburning Control Programs (January 26, 1994)

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3.10 Attainment Year 1996 UAM and CAL3QHC Modeling for Utah County CO SIP, Updated for Enhanced I/M (Annual), Oxygenated Fuel and Woodburning Control Programs (January 26, 1994)

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4.4 1990 Base-Year and 1996 Projection-Year Emission Inventories for Provo Carbon Monoxide SIP: Geneva Steel Portion (December 21, 1993)

4.5 Summary of CAL3QHC Modeling for Evaluations of Geneva CO Impacts (January 25, 1994)

4.6 ISCST2/COMPLEX1 Modeling for Estimating Impacts from Geneva Plant-wide CO Emissions (February 1, 1994)

4.7 Utah County SIP Point Source Modeling, Running eight-hour CO Concentrations (10th March, 1994)

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